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JAPANESE [JP,2000-059297,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And CDMA migration communication system which turns off transmission when a local station does not correspond to said propagation-loss minimal-basis ground office, and has two or more base stations which set transmission to ON in other than said condition.
[Claim 2] The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. Said propagation-loss minimal-basis ground office information, The mobile station which got down from the error detection information for performing error detection of said propagation-loss minimal-basis ground office information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said propagation-loss minimal-basis ground office information. It judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. It is judged with the magnitude of phasing being smaller than said threshold by this judgment. And CDMA migration communication system which turns off transmission when an error is not detected in said error detection and a local station does not correspond to said propagation-loss minimal-basis ground office, and has two or more base stations which set transmission to ON in other than said condition.
[Claim 3] The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each

base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, Eb/I0 in the communication line of each of said base station which performs a software handover is compared. The base station controller which this Eb/I0 judges the base station which is max as a propagation-loss minimal-basis ground office, and notifies to said each base station by making this judgment result into propagation-loss minimal-basis ground office information, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information. An error is not detected in error detection and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And CDMA migration communication system which turns off transmission when a local station does not correspond to said propagation-loss minimal-basis ground office, and has two or more base stations which set transmission to ON in other than said condition.

[Claim 4] Eb/I0 in the communication line of each of said base station which performs a software handover is compared. The base station controller which this Eb/I0 judges the base station which is max as a propagation-loss minimal-basis ground office, and notifies to said each base station by making this judgment result into propagation-loss minimal-basis ground office information, It judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. CDMA migration communication system which turns off transmission when it is judged with the magnitude of phasing being smaller than said threshold by this judgment and a local station does not correspond to said propagation-loss minimal-basis ground office, and has two or more base stations which set transmission to ON in other than said condition.

[Claim 5] The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, Eb/I0 in the communication line of each of said base station which performs a software handover is compared. The base station controller which this Eb/I0 judges the base station which is max as a propagation-loss minimal-basis ground office, and notifies to said each base station by making this judgment result into propagation-loss minimal-basis ground office information, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. When it judges whether the magnitude of phasing is larger than the threshold defined beforehand and an error is not detected in this error detection from said going-up circuit It is shown that the decoded magnitude said said whose phasing information which got down and was included in transmitted power information is phasing is smaller than said threshold. And when said decoded propagation-

loss minimal-basis ground office information which got down and was included in transmitted power information indicates that a local station does not correspond to said propagation-loss minimal-basis ground office, it turns off transmission. When transmission is turned on in other than said condition and an error is detected in this error detection It is shown that the magnitude whose phasing information judged from said going-up circuit is phasing is smaller than said threshold. And CDMA migration communication system with which it turns off transmission when the propagation-loss minimal-basis ground office information notified from said base station controller indicates that it does not correspond to said propagation-loss minimal-basis ground office, and the local station has two or more base stations which set transmission to ON in other than said condition.

[Claim 6] The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The base station which is below the reference value with which this propagation loss was defined beforehand is made into the base station which turns on transmission. The base station below said reference value makes the base station of min [propagation loss / this] the base station which turns on transmission, when one does not exist. The propagation-loss minimal-basis ground office information which shows the base station which turns on this transmission and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And CDMA migration communication system which turns off transmission when a local station does not correspond to said propagation-loss minimal-basis ground office, and has two or more base stations which set transmission to ON in other than said condition.

[Claim 7] The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And CDMA migration communication system which lowers transmitted power when a local station does not correspond to said propagation-loss minimal-basis ground office, and has two or more base stations which return transmitted power to the original value in other than said condition.

[Claim 8] CDMA migration communication system of seven given in any 1 term from claim 1 to which the judgment of the size of said phasing is performed based on the amount of fluctuation of the receiving level at the time of transmitted power control.
[Claim 9] CDMA migration communication system of seven given in any 1 term from claim 1 to which the judgment of the size of said phasing is performed based on the transmitted power control error which is an error of target received power and the actually received power.
[Claim 10] CDMA migration communication system of seven given in any 1 term from claim 1 to which the judgment of the size of said phasing is performed based on phasing vector variation.
[Claim 11] CDMA migration communication system of ten given in any 1 term from said claim 1 to which it gets down and transmitted power control is performed per frame.
[Claim 12] CDMA migration communication system of ten given in any 1 term from said claim 1 to which it gets down and transmitted power control is performed per slot.
[Claim 13] The propagation loss of the communication line set up between said each base station is searched for in a mobile station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured in a mobile station. The result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, Get down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, go up from said mobile station as transmitted power information, include in a circuit, and it transmits to said each base station. In said each base station, the going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And the going-down transmitted power control approach in the CDMA migration communication system which turns off transmission when a local station does not correspond to said propagation-loss minimal-basis ground office, and sets transmission to ON in other than said condition.
[Claim 14] The propagation loss of the communication line set up between said each base station is searched for in a mobile station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. Said propagation-loss minimal-basis ground office information, It gets down from the error detection information for performing error detection of said propagation-loss minimal-basis ground office information, goes up as transmitted power information, it includes in a circuit, and transmits to said each base station from said mobile station. In said each base station The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said propagation-loss minimal-basis ground office information. In said base station, it judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. It is judged with the magnitude of phasing being smaller than said threshold by this judgment. And the going-down transmitted power control approach in the CDMA migration communication system which turns off transmission when an error is not detected in said error detection and the base station concerned does not correspond to said propagation-loss minimal-basis ground office, and sets transmission to ON in other than said condition.
[Claim 15] The propagation loss of the communication line set up between said each base station is searched for in a mobile station from the difference of the transmitted power value of

the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured in a mobile station. The result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, Get down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, go up as transmitted power information, include in a circuit, and it transmits to said each base station from said mobile station. Eb/I0 in the communication line of each of said base station which performs a software handover is compared in a base station controller. The base station this whose Eb/I0 is max is judged as a propagation-loss minimal-basis ground office. It notifies to said each base station from said base station controller by making this judgment result into propagation-loss minimal-basis ground office information. In said base station The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information. An error is not detected in error detection and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And the going-down transmitted power control approach in the CDMA migration communication system which turns off transmission when a local station does not correspond to said propagation-loss minimal-basis ground office, and sets transmission to ON in other than said condition.

[Claim 16] Eb/I0 in the communication line of each of said base station which performs a software handover is compared in a base station controller. The base station this whose Eb/I0 is max is judged as a propagation-loss minimal-basis ground office. It notifies to said each base station from said base station controller by making this judgment result into propagation-loss minimal-basis ground office information. In said each base station, it judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. The going-down transmitted power control approach in the CDMA migration communication system which turns off transmission when it is judged with the magnitude of phasing being smaller than said threshold by this judgment and a local station does not correspond to said propagation-loss minimal-basis ground office, and sets transmission to ON in other than said condition.

[Claim 17] The propagation loss of the communication line set up between said each base station is searched for in a mobile station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured in a mobile station. The result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, Get down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, go up as transmitted power information, include in a circuit, and it transmits to said each base station from said mobile station. Eb/I0 in the communication line of each of said base station which performs a software handover is compared in a base station controller. The base station this whose Eb/I0 is max is judged as a propagation-loss minimal-basis ground office. It notifies to said each base station from said base station controller by making this judgment result into propagation-loss minimal-basis ground office information. In said base station The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. When it judges whether the magnitude of phasing is larger than the threshold defined beforehand and an error is not

detected in this error detection from said going-up circuit It is shown that the decoded magnitude said said whose phasing information which got down and was included in transmitted power information is phasing is smaller than said threshold. And when said decoded propagation-loss minimal-basis ground office information which got down and was included in transmitted power information indicates that a local station does not correspond to said propagation-loss minimal-basis ground office, it turns off transmission. When transmission is turned on in other than said condition and an error is detected in this error detection It is shown that the magnitude whose phasing information judged from said going-up circuit is phasing is smaller than said threshold. And the going-down transmitted power control approach in the CDMA migration communication system with which it turns off transmission when the local station indicates that it does not correspond to said propagation-loss minimal-basis ground office, and the propagation-loss minimal-basis ground office information notified from said base station controller sets transmission to ON in other than said condition.

[Claim 18] The propagation loss of the communication line set up between said each base station is searched for in a mobile station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel. The base station which is below the reference value with which this propagation loss was defined beforehand is made into the base station which turns on transmission. The base station below said reference value makes the base station of min [propagation loss / this] the base station which turns on transmission, when one does not exist. The propagation-loss minimal-basis ground office information which shows the base station which turns on this transmission and which is information is generated. The magnitude of phasing in said communication line is measured in a mobile station. The result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, Get down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, go up as transmitted power information, include in a circuit, and it transmits to said each base station from said mobile station. In said base station, the going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And the going-down transmitted power control approach in the CDMA migration communication system which turns off transmission when a local station does not correspond to said propagation-loss minimal-basis ground office, and sets transmission to ON in other than said condition.

[Claim 19] The propagation loss of the communication line set up between said each base station is searched for in a mobile station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured in a mobile station. The result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, Get down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, go up from said mobile station as transmitted power information, include in a circuit, and it transmits to said each base station. In said each base station, the going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said

threshold. And the going-down transmitted power control approach in the CDMA migration communication system which lowers transmitted power when a local station does not correspond to said propagation-loss minimal-basis ground office, and is returned at the original value of transmitted power in other than said condition.
[Claim 20] The going-down transmitted power control approach in the CDMA migration communication system of 19 given in any 1 term from claim 13 to which the judgment of the size of said phasing is performed based on the amount of fluctuation of the receiving level at the time of transmitted power control.
[Claim 21] The going-down transmitted power control approach in the CDMA migration communication system of 19 given in any 1 term from claim 13 to which the judgment of the size of said phasing is performed based on the transmitted power control error which is an error of target received power and the actually received power.
[Claim 22] The going-down transmitted power control approach in the CDMA migration communication system of 19 given in any 1 term from claim 13 to which the judgment of the size of said phasing is performed based on phasing vector variation.
[Claim 23] The going-down transmitted power control approach in the CDMA migration communication system of 22 given in any 1 term from said claim 13 to which it gets down and transmitted power control is performed per frame.
[Claim 24] The going-down transmitted power control approach in the CDMA migration communication system of 22 given in any 1 term from said claim 13 to which it gets down and transmitted power control is performed per slot.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the going-down transmitted power control approach especially in CDMA migration communication system about the CDMA (code division multiple access: Code Division MultipleAccess) migration communication system which consists of a mobile station, a base station, a base station controller, and the exchange.
[0002]
[Description of the Prior Art] In recent years, the CDMA communication mode strong against interference or active jamming attracts attention as a communication mode used for migration communication system. In a transmitting side, this CDMA communication mode diffuses a user signal to transmit with a diffusion sign, transmits, and is communication system which acquires the original user signal by performing the back diffusion of electrons using the diffusion sign same in a receiving side as that diffusion sign.
[0003] And in this CDMA migration communication system, it is spread using a different diffusion sign to which two or more transmitting sides have an orthogonality, respectively, and since each communication link can be specified by choosing the diffusion sign used in case the back diffusion of electrons is performed, the same frequency band can be used by two or more communication links at a receiving side.
[0004] However, since it is difficult to keep an orthogonality perfect among all the diffusion signs to be used, in fact, each diffusion sign does not serve as a perfect rectangular cross, but will have a correlation component among other signs. Therefore, for a self-communication link, these correlation components turn into an interferent component, and become the degradation factor of communication link quality. Since an interferent component arises by such factor, an interferent component also increases as the number of communicative increases. Therefore, the number of the communication lines which can carry out multiplex in a certain frequency band can be increased, so that the transmitted power of each communication line is low.
[0005] Therefore, the base station in CDMA migration communication system is controlling transmitted power of each mobile station to become Eb/I0 (for it to be called necessary Eb/I0 below) required in order that Eb/I0 (received wave power (Eb) of choice opposite interference wave power (I0) ratio) obtained by the communication line set up between each mobile station may secure communication link quality at its minimum. This transmitted power control is gone up and it is called transmitted power control.
[0006] The TPC (Transmission Power Contoroll: transmitted power control) information for [which gets down and directs a rise/down of transmitted power in a circuit to a mobile station] being transmitted to a mobile station is specifically included from the base station, and, as for the base station, this TPC information is performing a current rise or down directions of transmitted power to each mobile station.
[0007] The configuration of such CDMA migration communication system is shown in drawing 13 .
[0008] This CDMA migration communication system consists of the exchange 40, a base station controller 30, base stations 201 and 202, and a mobile station 10.

[0009] Although base station controllers other than base station controller 30 are connected in fact, a base station 201 and base stations other than 202 are connected to a base station controller 30 in fact and base stations 201 and 202 are communicating also with mobile stations other than mobile station 10 in fact in the exchange 40, it omits in order to simplify explanation here.
[0010] Moreover, the base station controller 30 has the ATM (Asynchronous Transfer Mode: Asynchronous Transfer Mode) switch 31 and the control section 32.
[0011] The ATM switch 31 is transmitted to the base station 201 or the base station 202 by making the ATM cel from the exchange into User Information 51 according to the destination address.
[0012] The control section 32 has transmitted the control information 52 for controlling actuation of base stations 201 and 202 to base stations 201 and 202.
[0013] Drawing 14 is the block diagram showing the configuration of the mobile station 10 in CDMA migration communication system.
[0014] The mobile station 10 consists of a demodulator 11, an analog-to-digital converter 12, the communication channel rake receiver 13, the decryption section 14, the perch CH rake receivers 151-153, the perch CH receiving level test sections 161-163, a control section 17, the receiving level test section 18, a subtractor 19, the transmitted power calculation section 21, the coding section 22, a digital-analog converter 23, and a modulator 24.
[0015] In a mobile station 10, in a demodulator 11, it gets over first, and the received going-down circuit is changed into baseband signaling, and is changed into a digital signal in an analog-to-digital converter 12. And in the communication channel rake receiver 13, rake composition of the digital signal is carried out, it decodes in the decryption section 14, and receiving-user information is extracted.
[0016] Moreover, as for the signal after rake composition was carried out in the communication channel rake receiver 13, the receiving level is measured in the receiving level test section 18.
[0017] Moreover, by being inputted into the perch CH rake receivers 151-153 and the perch CH receiving level test sections 161-163, the perch CH receiving level received from two or more base stations is measured, and the digital signal from an analog-to-digital converter 12 is transmitted to a control section 17.
[0018] Moreover, in a subtractor 19, the receiving level of a communication channel and that of the target level from a control section 17 which were measured in the receiving level test section 18, and the difference of a between calculate. And it is inputted into the transmitted power calculation section 21, and gets down, and the result of an operation is changed into transmitted power information.
[0019] It encodes in the coding section 22 and sending-user information is changed into an analog signal with the going-down transmitted power information searched for in the transmitted power calculation section 21 in the digital-analog converter 23. And the analog signal goes up, after becoming irregular in a modulator 24, and it is transmitted to a base station as a circuit (communication line from a mobile station to a base station).
[0020] Drawing 15 is the block diagram having shown the configuration of the base station 201 in CDMA migration communication system.
[0021] This base station 201 consists of a modulator 25, a digital-analog converter 26, the coding section 27, the transmitted power calculation section 28, a control section 29, the receiving level test section 41, a subtractor 42, an analog-to-digital converter 43, a communication channel rake receiver 44, a demodulator 45, and the decryption section 46.
[0022] In a base station 201, it had been received, and it gets over with a demodulator 45, and is changed into a digital signal in an analog-to-digital converter 43, rake composition is carried out in the communication channel rake receiver 44, and a circuit is decoded in the decryption section 46, and is extracted as receiving-user information.
[0023] Moreover, as for the signal after rake composition was carried out in the communication channel rake receiver 44, the receiving level is measured in the receiving level test section 41.
[0024] Moreover, in a subtractor 42, the receiving level of a communication channel and that of the target level from a control section 29 which were measured in the receiving level test

section 41, and the difference of a between calculate. And it is inputted into the transmitted power calculation section 28, gets down from a control section 29, and gets down with transmitting ON / off indication signal 47, and the result of an operation is changed into transmitted power information.
[0025] Moreover, it encodes in the coding section 27 and sending-user information is changed into an analog signal in a digital-analog converter 26 based on the going-down transmitted power information searched for in the transmitted power calculation section 28. And in a modulator 25, it becomes irregular, and gets down, and this analog signal is transmitted as a circuit.
[0026] The base station constitutes the cel which is the range which can communicate with a mobile station from such CDMA migration communication system. And a mobile station must perform the base station of the others which constitute the cel of a migration place, and the handover which sets up a new communication line in between, when moving setting up a communication line between a certain base stations and coming out of the cel of the base station.
[0027] The migration communication system by the spectrum diffusion method is performing the software handover, in order to avoid hits etc. and to maintain a quality of service, when performing the handover between base stations. As shown in drawing 16 , a software handover is the function peculiar to a spread spectrum system which one mobile station 10 communicates to two or more base stations 201 and 202 and coincidence, and can use the same radio frequency.
[0028] However, when a software handover is performed, in order to get down from two or more base stations and to transmit the same information as a circuit, the interference power which per communication link gets down, and the transmitted power of a circuit increases, consequently is given to other communication links increases, and it has become constraint of channel capacity.
[0029] In order to improve such constraint, as shown in drawing 17 , the method of per communication link getting down and reducing the transmitted power of a circuit is proposed by the following reference by getting down at the time of a software handover, and transmitting transmission from one base station with few propagation losses.
[0030] Reference: Base station selection mold power transmission-control" [in / Furukawa [NEC]"DS-CDMA cellular system gets down, and / a circuit] The Institute of Electronics, Information and Communication Engineers communication link society convention B-5-118 March, 1998, however this former get down, and by the transmitted power control approach, at the time of a software handover, since mustard or transmission is not performed, when only one base station has large phasing in a communication line, it always cannot secure user quality.
[0031] In multimedia communication, it is predicted that there are many rates of sending mass data to a mobile station from the database in a network side etc. If the specific gravity of multimedia communication will become large from now on, since to get down and to increase the wireless circuit capacity of a circuit compared with an uphill circuit is needed, such needs for the approach of getting down and reducing the transmitted power of a circuit exist.
[0032] In addition, by the going-up circuit which is a communication line from a mobile station to a base station being always 1 transmission per communication link, and receiving it in two or more base stations, since the effectiveness of a software handover has been acquired, when a software handover is performed, the problem that transmitted power increases is not generated.
[0033]
[Problem(s) to be Solved by the Invention] In the conventional CDMA migration communication system mentioned above, when the software handover was performed, per communication link got down, the transmitted power of a circuit increased, and there was a trouble that increase, and the interference power given to other communication links got down, and served as constraint of the channel capacity of a circuit.
[0034] The purpose of this invention is offering the CDMA migration communication system which can get down without worsening the quality of service of a communication line, and can reduce the channel capacity of a circuit, in case a software handover is performed.
[0035]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the CDMA

migration communication system of this invention The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And when a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.

[0036] A mobile station measures the propagation loss in the circuit between each base station, makes the base station the value of whose is min a propagation-loss minimal-basis ground office, measures the magnitude of phasing of a communication line, goes up the phasing information and propagation-loss minimal-basis ground office information by this invention, and transmits them to a circuit by it. And in a base station, when phasing is small and a local station does not correspond to a propagation-loss minimal-basis ground office, transmission is turned off.

[0037] Therefore, in case a software handover is performed, it can get down maintaining communication link quality, since transmission was performed to the mobile station with the sufficient condition of a communication line with small phasing only from one base station and transmission was performed to the mobile station with the bad condition of a communication line with large phasing from two or more base stations, and circuit capacity can be reduced.

[0038] Moreover, other CDMA migration communication system of this invention The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. Said propagation-loss minimal-basis ground office information, The mobile station which got down from the error detection information for performing error detection of said propagation-loss minimal-basis ground office information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said propagation-loss minimal-basis ground office information. It judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. It is judged with the magnitude of phasing being smaller than said threshold by this judgment. And when an error is not detected in said error detection and a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.

[0039] Not a mobile station but a base station goes up by this invention, and phasing of a communication line is measured from a circuit by it.

[0040] Moreover, other CDMA migration communication system of this invention The propagation loss of the communication line set up between said each base station from the

difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, Eb/I0 in the communication line of each of said base station which performs a software handover is compared. The base station controller which this Eb/I0 judges the base station which is max as a propagation-loss minimal-basis ground office, and notifies to said each base station by making this judgment result into propagation-loss minimal-basis ground office information, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information. An error is not detected in error detection and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And when a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.

[0041] A mobile station does not determine a propagation-loss minimal-basis ground office, but a base station and a base station controller go up by this invention, and it is made to measure from the received power of a circuit by it.

[0042] Moreover, other CDMA migration communication system of this invention Eb/I0 in the communication line of each of said base station which performs a software handover is compared. The base station controller which this Eb/I0 judges the base station which is max as a propagation-loss minimal-basis ground office, and notifies to said each base station by making this judgment result into propagation-loss minimal-basis ground office information, It judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. When it is judged with the magnitude of phasing being smaller than said threshold by this judgment and a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.

[0043] A mobile station does not determine a propagation-loss minimal-basis ground office, but a base station and a base station controller go up, and it is made to measure from the received power of a circuit, and not a mobile station but a base station goes up by this invention, and phasing of a communication line is measured from a circuit by it.

[0044] Therefore, since it is not necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, it is not necessary to change a format of the usual specification of an uphill circuit.

[0045] Moreover, other CDMA migration communication system of this invention The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted

power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And when a local station does not correspond to said propagation-loss minimal-basis ground office, transmitted power is lowered, and in other than said condition, it has two or more base stations which return transmitted power to the original value.
[0046] Since this invention is made to perform control which returns transmitted power when transmitted power is lowered when phasing is small and a local station does not correspond to a propagation-loss minimal-basis ground office, and a local station corresponds to a propagation-loss minimal-basis ground office, it can get down with communication link quality maintained, and it can reduce circuit capacity.
[0047]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained to a detail with reference to a drawing.
[0048] The 1st to 5th operation gestalt of this invention explained below gets down, when the software handover to which two or more base stations transmit the same contents to one mobile station is performed, and when phasing of a circuit is small, as only the base station in two or more base stations where the propagation loss in the communication line between the mobile station is the smallest communicates with the mobile station, other base stations are made to make transmission off.
[0049] There is little effectiveness acquired when the effect of phasing, such as the condition of standing it still, transmits from two or more base stations to the mobile station of few environments. Under large low-speed phasing of the effectiveness of the control which keeps received power constant by high-speed power control, since necessary Eb/I0 for acquiring necessary wireless quality can be made small, even if it gets down and transmits transmission from one base station with few propagation losses, a quality of service is not degraded.
[0050] Therefore, the going-down circuit capacity by getting down maintaining a quality of service by securing a receiving property and transmitting to the small mobile station of phasing from one base station by transmitting the same signal from two or more base stations to a mobile station, when phasing in a communication line with a base station is large, and decreasing interference of a circuit is reducible.
[0051] and the following the 1- where the 4th operation gestalt makes measurement of the magnitude of phasing and the decision of a propagation-loss minimal-basis ground office differ, respectively.
[0052] (1st operation gestalt) The CDMA migration communication system of the 1st operation gestalt of this invention is first explained with reference to drawing 1 - drawing 6 .
[0053] This operation gestalt gets down from a mobile station, and judges the magnitude of phasing in a circuit, and a mobile station detects a propagation-loss minimal-basis ground office from the received power of a perch channel.
[0054] Drawing 1 is the flow chart which showed actuation of the mobile station in the CDMA migration communication system of this operation gestalt.
[0055] A mobile station searches for the propagation loss of each communication line set up between each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel (step 101).
[0056] And a mobile station determines the base station whose propagation loss measured in each base station is min as a propagation-loss minimal-basis ground office (step 102).
[0057] And it judges whether phasing of a mobile station is large by comparing a transmitted power control error with a certain threshold (step 103).
[0058] Here, the concrete method of judging size of phasing with reference to drawing 2 is explained.
[0059] In order to detect the amount of phasing in a certain communication line, it is carried out by measuring the transmitted power control error which is the amount of fluctuation of the

receiving level at the time of transmitted power control, or an error of target received power and the actually received power, and generally asking for the distribution or standard deviation.
[0060] It is because it becomes impossible to keep received power constant by high-speed power control correctly when phasing fluctuation is large as it is shown in drawing 2 (a), although an amount of receiving level variation or transmitted power control error becomes small since received power can be kept constant by high-speed power control when phasing [in / as shown in drawing 2 (b) / a communication line] is loose, so an amount of receiving level variation or transmitted power control error becomes large.
[0061] Moreover, the amount of receiving level variation or a transmitted power control error is averaged and searched for for every fixed period, is searched for with the moving average, or is searched for using an oblivion multiplier.
[0062] Here, the moving average means asking for the average between the value at a certain time, and the value at two or more times which exists between in front of a fixed period from the time. for example, when the value a1, a2, a3, and ... is acquired like drawing 3 and a5 is obtained The value which calculated the average of the value to a2-a6 when the average of the value to a1-a5 was calculated and a6 was obtained, and calculated the average of the value to a3-a7 when a7 was obtained is a value by the moving average.
[0063] Moreover, it is the approach of the approach using an oblivion multiplier carrying out the multiplication of the oblivion multiplier which is a fixed value smaller than 1 to the value acquired even at the front at a certain time, and adding the value and the value which carried out the multiplication of the value which subtracted the oblivion multiplier from 1 to the value at a certain time, and making it into this value. For example, if a block diagram shows count by this approach, the value which carried out the multiplication of the beta (oblivion multiplier) to the last output as shown in drawing 4 , and the value which carried out the multiplication of the 1-beta to this value will be added, and it will consider as this output.
[0064] Furthermore, the option which detects the magnitude of phasing is the approach of measuring the distribution or standard deviation of phasing vector variation obtained when performing channel presumption. When distribution or the standard deviation of phasing vector variation is large, it judges that phasing is large, and when distribution or a standard deviation is small, it is judged that phasing is small. It averages and asks also for distribution or standard deviation of phasing vector variation for every fixed period, asks with the moving average, or asks using an oblivion multiplier.
[0065] And in periodic or when [when a propagation-loss minimal-basis ground office is changed, or when the judgment result of the magnitude of phasing changes], a mobile station gets down from phasing information and propagation-loss minimal-basis ground office information to an uphill circuit instead of user data, and is set up as transmitted power information. Moreover, error detection information (CRC (Cyclic Redundancy Check) information) is set up as information for [this] getting down and performing error detection of a transmitted power information part (step 104). It gets down to drawing 5 and a format of a circuit and a going-up circuit is shown.
[0066] Next, actuation of a base station is explained with reference to the flow chart of drawing 6 .
[0067] A base station decodes the information included in the uphill circuit from the mobile station (step 201). And the information decoded and acquired gets down, and in being transmitted power information, it performs error detection using CRC information to phasing information and propagation-loss minimal-basis ground office information (step 202).
[0068] And it judges whether an error is not detected in error detection, but phasing of a base station is small, and a local station corresponds to a propagation-loss minimal-basis ground office (steps 202-204).
[0069] And it gets down and there is no error in transmitted power information, phasing of a base station is small, when it does not correspond to a propagation-loss minimal-basis ground office, it turns off transmission (step 205), and when other, it sets transmission to ON (step 206).
[0070] It gets down, and since [which is depended on this operation gestalt] it gets down, it gets down using the information on a circuit and the transmitted power control approach is

performing transmitted power control of a circuit, it is reliable. However, since it is necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, the format for getting down from phasing information and propagation-loss minimal-basis ground office information, and transmitting as transmitted power information must be considered as a format of standard specifications.

[0071] (2nd operation gestalt) Next, the CDMA migration communication system of the 2nd operation gestalt of this invention is explained.

[0072] A base station/base station controller goes up this operation gestalt, the magnitude of phasing is judged from a circuit, and a mobile station determines a propagation-loss minimal-basis ground office from the received power of a perch channel.

[0073] First, the processing in the mobile station of this operation gestalt is explained with reference to the flow chart of drawing 7 .

[0074] The mobile station in this operation gestalt deletes the processing which the size of phasing of step 103 judges from actuation of the mobile station in the 1st operation gestalt shown with the flow chart of drawing 1 .

[0075] And periodic or when a propagation-loss minimal-basis ground office is changed, a mobile station gets down from propagation-loss minimal-basis ground office information to an uphill circuit instead of user data, and is set up as transmitted power information. Moreover, error detection information is set up as information for [this] getting down and performing error detection of a transmitted power information part (step 105).

[0076] Next, the processing in the base station/base station controller of this operation gestalt is explained with reference to the flow chart of drawing 8 .

[0077] A base station decodes the information included in the uphill circuit from the mobile station, the information decoded and acquired gets down from an uphill circuit, and in being transmitted power information, it performs error detection using CRC information to propagation-loss minimal-basis ground office information (step 201).

[0078] And a base station judges size of phasing by measuring whether it is beyond a threshold with the transmitted power control error in the going-up circuit from a mobile station. And the judgment result is transmitted to a base station controller (step 207).

[0079] And as for the base station, an error was not detected in error detection, the purport that phasing was small was notified in all base stations from the base station controller, or a local station judges whether it corresponds to a propagation-loss minimal-basis ground office (steps 202-204).

[0080] And it gets down, there is no error in transmitted power information, the purport that phasing is small is notified in all base stations from a base station controller, a base station turns off transmission, when a local station does not correspond to a propagation-loss minimal-basis ground office (step 205), and when other, it sets transmission to ON (step 206).

[0081] Moreover, although not shown in the flow chart of drawing 8 , a base station controller notifies that to each base station, when at least one judgment result that phasing is large is included by something among the judgment results of phasing notified from each base station, and when all judgment results are as a result of [that phasing is small] a judgment, it notifies that to each base station.

[0082] It gets down, and since [which is depended on this operation gestalt] it gets down, it gets down using the information on a circuit and the transmitted power control approach is performing transmitted power control of a circuit, it is reliable. However, since it is necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, the format for getting down from propagation-loss minimal-basis ground office information, and transmitting as transmitted power information must be considered as a format of standard specifications. Moreover, in order to go up phasing information and to obtain from the propagation condition of a circuit, it will get down with an uphill circuit and the error by the difference in the frequency of a circuit will be included.

[0083] With this operation gestalt, when each base station notified the judgment result of the size of phasing to a base station controller, a base station controller was judged as phasing being small in all base stations and it corresponded to a propagation-loss minimal-basis ground office

to each base station, it had permitted turning off transmission. However, each base station does not notify the result of the size of phasing to a base station controller, but judges original with each base station, and when phasing is small and a local station is not a propagation-loss minimal-basis ground office, you may make it turn off transmission. In this case, since it is not necessary to exchange control information between a base station and a base station controller, quick transmitted power control can be performed.

[0084] (3rd operation gestalt) Next, the CDMA migration communication system of the 3rd operation gestalt of this invention is explained.

[0085] A mobile station gets down, the magnitude of phasing is judged from a circuit, a base station/exchange goes up, and this operation gestalt determines a propagation-loss minimal-basis ground office from the received power of a circuit.

[0086] First, the processing in the mobile station of this operation gestalt is explained with reference to the flow chart of drawing 9 .

[0087] The mobile station in this operation gestalt deletes the processing which determines the propagation-loss minimal-basis ground office of steps 101 and 102 from actuation of the mobile station in the 1st operation gestalt shown with the flow chart of drawing 1 .

[0088] And periodic or when the judgment result of the magnitude of phasing changes, a mobile station gets down from phasing information to an uphill circuit instead of user data, and is set up as transmitted power information. Moreover, error detection information is set up as information for [this] getting down and performing error detection of a transmitted power information part (step 106).

[0089] Next, the processing in the base station/base station controller of this operation gestalt is explained with reference to the flow chart of drawing 10 .

[0090] A base station decodes the information included in the uphill circuit from the mobile station, the information decoded and acquired gets down from an uphill circuit, and in being transmitted power information, it performs error detection using CRC information to phasing information (step 201).

[0091] And a base station controller compares Eb/I0 in the communication line of each base station of a certain channel which performs a software handover, judges the base station whose Eb/I0 is max as a propagation-loss minimal-basis ground office, and notifies it to each base station by making the judgment result into propagation-loss minimal-basis ground office information (step 208).

[0092] And it judges whether an error is not detected in error detection, but phasing of a base station is small, and a local station corresponds to a propagation-loss minimal-basis ground office (steps 202-204).

[0093] And it gets down and there is no error in transmitted power information, phasing of a base station is small, when a local station does not correspond to a propagation-loss minimal-basis ground office, it turns off transmission (step 205), and when other, it sets transmission to ON (step 206).

[0094] It gets down, and since [which is depended on this operation gestalt] it gets down, it gets down using the information on a circuit and the transmitted power control approach is performing transmitted power control of a circuit, it is reliable. However, since it is necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, the format for getting down from phasing information and transmitting as transmitted power information must be considered as a format of standard specifications. Moreover, in order to go up propagation-loss minimal-basis ground office information and to obtain from the propagation condition of a circuit, it will get down with an uphill circuit and the error by the difference in the frequency of a circuit will be included. Furthermore, the information on the propagation loss in each communication line obtained in the base station is brought together in a base station controller, a propagation-loss minimal-basis ground office is determined in a base station controller, and since the information is notified to each base station, control delay will occur.

[0095] (4th operation gestalt) Next, the CDMA migration communication system of the 4th operation gestalt of this invention is explained.

[0096] A base station/base station controller goes up, the magnitude of phasing is judged from a circuit, a base station/exchange goes up, and this operation gestalt determines a propagation-loss minimal-basis ground office from the received power of a circuit.
[0097] The explanation is omitted in order that the mobile station of this operation gestalt may perform the same actuation as the mobile station which does not apply this invention.
[0098] The processing in the base station/base station controller of this operation gestalt is explained with reference to the flow chart of drawing 11 .
[0099] A base station judges size of phasing by measuring whether it is beyond a threshold with the transmitted power control error in the going-up circuit from a mobile station. And the judgment result is transmitted to a base station controller (step 207).
[0100] And a base station controller compares Eb/I0 in the communication line of each base station of a certain channel which performs a software handover, judges the base station whose Eb/I0 is max as a propagation-loss minimal-basis ground office, and notifies it to each base station by making the judgment result into propagation-loss minimal-basis ground office information (step 208).
[0101] And in all base stations, the purport that phasing was small was notified from the base station controller, or, as for a base station, a local station judges whether it corresponds to a propagation-loss minimal-basis ground office (steps 203 and 204).
[0102] And in all base stations, the purport that phasing is small is notified from a base station controller, a base station turns off transmission, when a local station does not correspond to a propagation-loss minimal-basis ground office (step 205), and when other, it sets transmission to ON (step 206).
[0103] Moreover, although not shown in the flow chart of drawing 11 , a base station controller notifies that to each base station, when at least one judgment result that phasing is large is included by something among the judgment results of phasing notified from each base station, and when all judgment results are as a result of [that phasing is small] a judgment, it notifies that to each base station.
[0104] It gets down, and since [which is depended on this operation gestalt] it is not necessary to go up from a mobile station to a base station, and to get down through a circuit and the transmitted power control approach does not need to transmit transmitted power information, it does not need to change a format of the usual specification. Moreover, in order to go up propagation-loss minimal-basis ground office information and phasing information and to obtain from the propagation condition of a circuit, it will get down with an uphill circuit and the error by the difference in the frequency of a circuit will be included. Furthermore, the information acquired in the base station is brought together in a base station controller, the decision of a propagation-loss minimal-basis ground office and the decision of phasing size are made in a base station controller, and since the information is notified to each base station, control delay will occur.
[0105] With this operation gestalt, when each base station notified the judgment result of the size of phasing to a base station controller, a base station controller was judged as phasing being small in all base stations and it corresponded to a propagation-loss minimal-basis ground office to each base station, it had permitted turning off transmission. However, each base station does not notify the result of the size of phasing to a base station controller, but judges original with each base station, and when phasing is small and a local station is not a propagation-loss minimal-basis ground office, you may make it turn off transmission. In this case, since it is not necessary to exchange control information between a base station and a base station controller, quick transmitted power control can be performed.
[0106] (5th operation gestalt) This operation gestalt combines the 4th four operation gestalt from the above 1st. above-mentioned the 1- although the configuration of the 4th four operation gestalt operates also independently, it can enlarge the degree of freedom of a system by combining.
[0107] the following table 1 -- the 1- the difference in the 4th operation gestalt is shown.
[0108]
[Table 1]

	第１の実施形態	第２の実施形態	第３の実施形態	第４の実施形態
フェージングの大きさ	移動局が下り回線から測定	基地局が上り回線から測定	移動局が下り回線から測定	基地局が上り回線から測定
伝搬損失最小基地局	移動局がとまり木チャネルから測定	←	基地局が上り回線の受信電力から測定	←

For example, while a mobile station gets down and judging the magnitude of phasing by the circuit by combining the 1st and 4th operation gestalt, a propagation-loss minimal-basis ground office is determined from the received power of a perch channel, and while a base station/base station controller goes up and judging the size of phasing in a circuit from a circuit, a propagation-loss minimal-basis ground office is determined from the received power of an uphill circuit. And a base station/base station controller controls transmitting ON / OFF of a base station from two or more of such information.

[0109] In such a case, for example, the following three control approaches, it is.

(1) Since [which cannot get down and cannot use transmitted power information] a base station is included in an uphill circuit when an error is detected by the uphill circuit, it controls transmitting ON / OFF of a base station using the size information on phasing obtained with the base station/base station controller, and transmitting ON / OFF information.

(2) In the case of the judgment result that the both sides of the judgment result based on the information acquired from the uphill circuit and the judgment result based on the information acquired with the base station/base station controller turn off both transmission of a base station, a base station makes transmission off.

(3) the case of the judgment result that either the judgment result based on the information acquired from the uphill circuit or the judgment result based on the information acquired with the base station/base station controller turns off transmission of a base station, as for a base station -- transmission -- suppose that it is off.

[0110] Although it has the fault that a configuration becomes complicated in getting down combining two or more information like this operation gestalt and performing transmitted power control, it has the advantage in which the dependability of transmitting change control can be raised.

[0111] (6th operation gestalt) Next, the CDMA migration communication system of the 6th operation gestalt of this invention is explained.

[0112] In CDMA migration communication system, although one base station constitutes one cel, in order to attain large capacity-ization of a communication line, sector-ization is performed. This sector-ization is the approach of giving directivity to the antenna of a base station and dividing one cel into the area of plurality, such as three and six [for example,]. And the area which divided this cel is called the sector.

[0113] The CDMA migration communication system with which such sector-ization was performed is shown in drawing 12 .

[0114] Base stations 201-203 constitute cels 60-62 from drawing 12 , respectively. And the cel 60 is divided into three sectors 60a, 60b, and 60c. Moreover, cels 61 and 62 are similarly divided into three sectors.

[0115] Here, the handover performed in case it moves between the sectors from which a mobile station differs is called the SOFUTA handover.

[0116] Thus, in the sector-ized CDMA migration communication system, when it exists in the location as a mobile station 10 shows to drawing 12 , for example, in case software or a SOFUTA handover is performed, also when [eight] it gets down and a circuit is used, it may generate to one mobile station 10.

[0117] the CDMA migration communication system with which such sector-ization was performed -- receiving -- above-mentioned the 1- the case where the former will get down and software or a SOFUTA handover will be performed by eight circuits by the transmitted power control approach if the 5th operation gestalt gets down and the transmitted power control approach is applied -- one circuit -- leaving -- other circuits -- transmission -- it will be off.

However, in what was performing HANDO over by eight circuits becoming only one circuit, since the difference is too large, also when phasing is small and degradation of a quality of service cannot be permitted even if, it may generate.
[0118] Therefore, this operation gestalt gets down, and by the transmitted power control approach, the propagation loss of a circuit does not consider only the minimum base station as transmitting ON, but it is made to consider all the base stations that are below constant value with the propagation loss of a communication line as transmitting ON, and when the propagation loss of all base stations is larger than constant value, a propagation loss considers only the minimum base station as transmitting ON.
[0119] By such control, also at the lowest, two or more offices where a propagation loss is usually small serve as transmitting ON, and one base station can suppress degradation of a quality of service to minimum while serving as transmitting ON.
[0120] With the 6th operation gestalt, it may get down from the above 1st, ON / off control of transmitted power may be performed per frame, and you may carry out per slot.
[0121] Moreover, although the propagation loss of a communication line was searched for with the 6th operation gestalt from the above 1st, it got down noting that the circuit between the base stations of min [propagation loss / the] was a circuit with the most sufficient condition for the mobile station, and transmitted power control was performed, the base station which uses a power level on reception instead of a propagation loss, and serves as a circuit with the most sufficient condition for the mobile station may be determined. In this case, the base station where a power level on reception is naturally the largest is determined as a base station with the sufficient condition of a circuit.
[0122] Furthermore, in case a software handover or a SOFUTA handover is performed with the 6th operation gestalt from the above 1st, as only the base station where the propagation loss in the communication line between mobile stations is the smallest communicates with the mobile station as a propagation-loss minimal-basis ground office, it gets down by turning off transmission and other base stations are reducing the channel capacity of a circuit. However, it can get down by performing control which lowers transmitted power, and this invention can acquire the same effectiveness that the channel capacity of a circuit is reducible, even if it is not limited to such control and any base stations other than a propagation-loss minimal-basis ground office do not make transmission completely off.
[0123]
[Effect of the Invention] As explained above, it gets down without worsening the quality of service of a communication line, and this invention has the effectiveness that the channel capacity of a circuit is reducible, in case software or a SOFUTA handover is performed.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the going-down transmitted power control approach especially in CDMA migration communication system about the CDMA (code division multiple access: Code Division MultipleAccess) migration communication system which consists of a mobile station, a base station, a base station controller, and the exchange.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] In recent years, the CDMA communication mode strong against interference or active jamming attracts attention as a communication mode used for migration communication system. In a transmitting side, this CDMA communication mode diffuses a user signal to transmit with a diffusion sign, transmits, and is communication system which acquires the original user signal by performing the back diffusion of electrons using the diffusion sign same in a receiving side as that diffusion sign.
[0003] And in this CDMA migration communication system, it is spread using a different diffusion sign to which two or more transmitting sides have an orthogonality, respectively, and since each communication link can be specified by choosing the diffusion sign used in case the back diffusion of electrons is performed, the same frequency band can be used by two or more communication links at a receiving side.
[0004] However, since it is difficult to keep an orthogonality perfect among all the diffusion signs to be used, in fact, each diffusion sign does not serve as a perfect rectangular cross, but will have a correlation component among other signs. Therefore, for a self-communication link, these correlation components turn into an interferent component, and become the degradation factor of communication link quality. Since an interferent component arises by such factor, an interferent component also increases as the number of communicative increases. Therefore, the number of the communication lines which can carry out multiplex in a certain frequency band can be increased, so that the transmitted power of each communication line is low.
[0005] Therefore, the base station in CDMA migration communication system is controlling transmitted power of each mobile station to become Eb/I0 (for it to be called necessary Eb/I0 below) required in order that Eb/I0 (received wave power (Eb) of choice opposite interference wave power (I0) ratio) obtained by the communication line set up between each mobile station may secure communication link quality at its minimum. This transmitted power control is gone up and it is called transmitted power control.
[0006] The TPC (Transmission Power Contoroll: transmitted power control) information for [which gets down and directs a rise/down of transmitted power in a circuit to a mobile station] being transmitted to a mobile station is specifically included from the base station, and, as for the base station, this TPC information is performing a current rise or down directions of transmitted power to each mobile station.
[0007] The configuration of such CDMA migration communication system is shown in drawing 13 .
[0008] This CDMA migration communication system consists of the exchange 40, a base station controller 30, base stations 201 and 202, and a mobile station 10.
[0009] Although base station controllers other than base station controller 30 are connected in fact, a base station 201 and base stations other than 202 are connected to a base station controller 30 in fact and base stations 201 and 202 are communicating also with mobile stations other than mobile station 10 in fact in the exchange 40, it omits in order to simplify explanation here.
[0010] Moreover, the base station controller 30 has the ATM (Asynchronous Transfer Mode: Asynchronous Transfer Mode) switch 31 and the control section 32.

[0011] The ATM switch 31 is transmitted to the base station 201 or the base station 202 by making the ATM cel from the exchange into User Information 51 according to the destination address.
[0012] The control section 32 has transmitted the control information 52 for controlling actuation of base stations 201 and 202 to base stations 201 and 202.
[0013] Drawing 14 is the block diagram showing the configuration of the mobile station 10 in CDMA migration communication system.
[0014] The mobile station 10 consists of a demodulator 11, an analog-to-digital converter 12, the communication channel rake receiver 13, the decryption section 14, the perch CH rake receivers 151-153, the perch CH receiving level test sections 161-163, a control section 17, the receiving level test section 18, a subtractor 19, the transmitted power calculation section 21, the coding section 22, a digital-analog converter 23, and a modulator 24.
[0015] In a mobile station 10, in a demodulator 11, it gets over first, and the received going-down circuit is changed into baseband signaling, and is changed into a digital signal in an analog-to-digital converter 12. And in the communication channel rake receiver 13, rake composition of the digital signal is carried out, it decodes in the decryption section 14, and receiving-user information is extracted.
[0016] Moreover, as for the signal after rake composition was carried out in the communication channel rake receiver 13, the receiving level is measured in the receiving level test section 18.
[0017] Moreover, by being inputted into the perch CH rake receivers 151-153 and the perch CH receiving level test sections 161-163, the perch CH receiving level received from two or more base stations is measured, and the digital signal from an analog-to-digital converter 12 is transmitted to a control section 17.
[0018] Moreover, in a subtractor 19, the receiving level of a communication channel and that of the target level from a control section 17 which were measured in the receiving level test section 18, and the difference of a between calculate. And it is inputted into the transmitted power calculation section 21, and gets down, and the result of an operation is changed into transmitted power information.
[0019] It encodes in the coding section 22 and sending-user information is changed into an analog signal with the going-down transmitted power information searched for in the transmitted power calculation section 21 in the digital-analog converter 23. And the analog signal goes up, after becoming irregular in a modulator 24, and it is transmitted to a base station as a circuit (communication line from a mobile station to a base station).
[0020] Drawing 15 is the block diagram having shown the configuration of the base station 201 in CDMA migration communication system.
[0021] This base station 201 consists of a modulator 25, a digital-analog converter 26, the coding section 27, the transmitted power calculation section 28, a control section 29, the receiving level test section 41, a subtractor 42, an analog-to-digital converter 43, a communication channel rake receiver 44, a demodulator 45, and the decryption section 46.
[0022] In a base station 201, it had been received, and it gets over with a demodulator 45, and is changed into a digital signal in an analog-to-digital converter 43, rake composition is carried out in the communication channel rake receiver 44, and a circuit is decoded in the decryption section 46, and is extracted as receiving-user information.
[0023] Moreover, as for the signal after rake composition was carried out in the communication channel rake receiver 44, the receiving level is measured in the receiving level test section 41.
[0024] Moreover, in a subtractor 42, the receiving level of a communication channel and that of the target level from a control section 29 which were measured in the receiving level test section 41, and the difference of a between calculate. And it is inputted into the transmitted power calculation section 28, gets down from a control section 29, and gets down with transmitting ON / off indication signal 47, and the result of an operation is changed into transmitted power information.
[0025] Moreover, it encodes in the coding section 27 and sending-user information is changed into an analog signal in a digital-analog converter 26 based on the going-down transmitted power information searched for in the transmitted power calculation section 28. And in a modulator 25,

it becomes irregular, and gets down, and this analog signal is transmitted as a circuit.
[0026] The base station constitutes the cel which is the range which can communicate with a mobile station from such CDMA migration communication system. And a mobile station must perform the base station of the others which constitute the cel of a migration place, and the handover which sets up a new communication line in between, when moving setting up a communication line between a certain base stations and coming out of the cel of the base station.
[0027] The migration communication system by the spectrum diffusion method is performing the software handover, in order to avoid hits etc. and to maintain a quality of service, when performing the handover between base stations. As shown in drawing 16 , a software handover is the function peculiar to a spread spectrum system which one mobile station 10 communicates to two or more base stations 201 and 202 and coincidence, and can use the same radio frequency.
[0028] However, when a software handover is performed, in order to get down from two or more base stations and to transmit the same information as a circuit, the interference power which per communication link gets down, and the transmitted power of a circuit increases, consequently is given to other communication links increases, and it has become constraint of channel capacity.
[0029] In order to improve such constraint, as shown in drawing 17 , the method of per communication link getting down and reducing the transmitted power of a circuit is proposed by the following reference by getting down at the time of a software handover, and transmitting transmission from one base station with few propagation losses.
[0030] Reference: Base station selection mold power transmission-control" [in / Furukawa [NEC]"DS-CDMA cellular system gets down, and / a circuit] The Institute of Electronics, Information and Communication Engineers communication link society convention B-5-118 March, 1998, however this former get down, and by the transmitted power control approach, at the time of a software handover, since mustard or transmission is not performed, when only one base station has large phasing in a communication line, it always cannot secure user quality.
[0031] In multimedia communication, it is predicted that there are many rates of sending mass data to a mobile station from the database in a network side etc. If the specific gravity of multimedia communication will become large from now on, since to get down and to increase the wireless circuit capacity of a circuit compared with an uphill circuit is needed, such needs for the approach of getting down and reducing the transmitted power of a circuit exist.
[0032] In addition, by the going-up circuit which is a communication line from a mobile station to a base station being always 1 transmission per communication link, and receiving it in two or more base stations, since the effectiveness of a software handover has been acquired, when a software handover is performed, the problem that transmitted power increases is not generated.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, it gets down without worsening the quality of service of a communication line, and this invention has the effectiveness that the channel capacity of a circuit is reducible, in case software or a SOFUTA handover is performed.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In the conventional CDMA migration communication system mentioned above, when the software handover was performed, per communication link got down, the transmitted power of a circuit increased, and there was a trouble that increase, and the interference power given to other communication links got down, and served as constraint of the channel capacity of a circuit.
[0034] The purpose of this invention is offering the CDMA migration communication system which can get down without worsening the quality of service of a communication line, and can reduce the channel capacity of a circuit, in case a software handover is performed.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the CDMA migration communication system of this invention The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And when a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.
[0036] A mobile station measures the propagation loss in the circuit between each base station, makes the base station the value of whose is min a propagation-loss minimal-basis ground office, measures the magnitude of phasing of a communication line, goes up the phasing information and propagation-loss minimal-basis ground office information by this invention, and transmits them to a circuit by it. And in a base station, when phasing is small and a local station does not correspond to a propagation-loss minimal-basis ground office, transmission is turned off.
[0037] Therefore, in case a software handover is performed, it can get down maintaining communication link quality, since transmission was performed to the mobile station with the sufficient condition of a communication line with small phasing only from one base station and transmission was performed to the mobile station with the bad condition of a communication line with large phasing from two or more base stations, and circuit capacity can be reduced.
[0038] Moreover, other CDMA migration communication system of this invention The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. Said propagation-loss minimal-basis ground office information, The mobile station which got down from the error detection information for performing error detection of said propagation-

loss minimal-basis ground office information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said propagation-loss minimal-basis ground office information. It judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. It is judged with the magnitude of phasing being smaller than said threshold by this judgment. And when an error is not detected in said error detection and a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.

[0039] Not a mobile station but a base station goes up by this invention, and phasing of a communication line is measured from a circuit by it.

[0040] Moreover, other CDMA migration communication system of this invention The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, Eb/I0 in the communication line of each of said base station which performs a software handover is compared. The base station controller which this Eb/I0 judges the base station which is max as a propagation-loss minimal-basis ground office, and notifies to said each base station by making this judgment result into propagation-loss minimal-basis ground office information, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information. An error is not detected in error detection and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And when a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.

[0041] A mobile station does not determine a propagation-loss minimal-basis ground office, but a base station and a base station controller go up by this invention, and it is made to measure from the received power of a circuit by it.

[0042] Moreover, other CDMA migration communication system of this invention Eb/I0 in the communication line of each of said base station which performs a software handover is compared. The base station controller which this Eb/I0 judges the base station which is max as a propagation-loss minimal-basis ground office, and notifies to said each base station by making this judgment result into propagation-loss minimal-basis ground office information, It judges whether the magnitude of phasing is larger than the threshold defined beforehand from said going-up circuit. When it is judged with the magnitude of phasing being smaller than said threshold by this judgment and a local station does not correspond to said propagation-loss minimal-basis ground office, transmission is turned off, and in other than said condition, it has two or more base stations which set transmission to ON.

[0043] A mobile station does not determine a propagation-loss minimal-basis ground office, but a base station and a base station controller go up, and it is made to measure from the received power of a circuit, and not a mobile station but a base station goes up by this invention, and phasing of a communication line is measured from a circuit by it.

[0044] Therefore, since it is not necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, it is not necessary to

change a format of the usual specification of an uphill circuit.
[0045] Moreover, other CDMA migration communication system of this invention The propagation loss of the communication line set up between said each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel is searched for. The propagation-loss minimal-basis ground office information which shows the base station this whose propagation loss is min and which is information is generated. The magnitude of phasing in said communication line is measured, and the result of having judged whether the value of the magnitude of this phasing having been larger than the threshold defined beforehand is generated as phasing information. Said propagation-loss minimal-basis ground office information, The mobile station which got down from said phasing information and the error detection information for performing error detection of said propagation-loss minimal-basis ground office information and said phasing information, went up as transmitted power information, and has been included and transmitted to the circuit, The going-down transmitted power information included in the uphill circuit from said mobile station is decoded. Error detection using said error detection information is performed to said phasing information and said propagation-loss minimal-basis ground office information. An error is not detected in this error detection, and it is shown that the magnitude said whose phasing information is phasing is smaller than said threshold. And when a local station does not correspond to said propagation-loss minimal-basis ground office, transmitted power is lowered, and in other than said condition, it has two or more base stations which return transmitted power to the original value.
[0046] Since this invention is made to perform control which returns transmitted power when transmitted power is lowered when phasing is small and a local station does not correspond to a propagation-loss minimal-basis ground office, and a local station corresponds to a propagation-loss minimal-basis ground office, it can get down with communication link quality maintained, and it can reduce circuit capacity.
[0047]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained to a detail with reference to a drawing.
[0048] The 1st to 5th operation gestalt of this invention explained below gets down, when the software handover to which two or more base stations transmit the same contents to one mobile station is performed, and when phasing of a circuit is small, as only the base station in two or more base stations where the propagation loss in the communication line between the mobile station is the smallest communicates with the mobile station, other base stations are made to make transmission off.
[0049] There is little effectiveness acquired when the effect of phasing, such as the condition of standing it still, transmits from two or more base stations to the mobile station of few environments. Under large low-speed phasing of the effectiveness of the control which keeps received power constant by high-speed power control, since necessary Eb/I0 for acquiring necessary wireless quality can be made small, even if it gets down and transmits transmission from one base station with few propagation losses, a quality of service is not degraded.
[0050] Therefore, the going-down circuit capacity by getting down maintaining a quality of service by securing a receiving property and transmitting to the small mobile station of phasing from one base station by transmitting the same signal from two or more base stations to a mobile station, when phasing in a communication line with a base station is large, and decreasing interference of a circuit is reducible.
[0051] and the following the 1- where the 4th operation gestalt makes measurement of the magnitude of phasing and the decision of a propagation-loss minimal-basis ground office differ, respectively.
[0052] (1st operation gestalt) The CDMA migration communication system of the 1st operation gestalt of this invention is first explained with reference to drawing 1 - drawing 6 .
[0053] This operation gestalt gets down from a mobile station, and judges the magnitude of phasing in a circuit, and a mobile station detects a propagation-loss minimal-basis ground office from the received power of a perch channel.

[0054] Drawing 1 is the flow chart which showed actuation of the mobile station in the CDMA migration communication system of this operation gestalt.
[0055] A mobile station searches for the propagation loss of each communication line set up between each base station from the difference of the transmitted power value of the perch channel reported from each base station which performs software HANDO over, and the received power of the actually received perch channel (step 101).
[0056] And a mobile station determines the base station whose propagation loss measured in each base station is min as a propagation-loss minimal-basis ground office (step 102).
[0057] And it judges whether phasing of a mobile station is large by comparing a transmitted power control error with a certain threshold (step 103).
[0058] Here, the concrete method of judging size of phasing with reference to drawing 2 is explained.
[0059] In order to detect the amount of phasing in a certain communication line, it is carried out by measuring the transmitted power control error which is the amount of fluctuation of the receiving level at the time of transmitted power control, or an error of target received power and the actually received power, and generally asking for the distribution or standard deviation.
[0060] It is because it becomes impossible to keep received power constant by high-speed power control correctly when phasing fluctuation is large as it is shown in drawing 2 (a), although an amount of receiving level variation or transmitted power control error becomes small since received power can be kept constant by high-speed power control when phasing [in / as shown in drawing 2 (b) / a communication line] is loose, so an amount of receiving level variation or transmitted power control error becomes large.
[0061] Moreover, the amount of receiving level variation or a transmitted power control error is averaged and searched for for every fixed period, is searched for with the moving average, or is searched for using an oblivion multiplier.
[0062] Here, the moving average means asking for the average between the value at a certain time, and the value at two or more times which exists between in front of a fixed period from the time. for example, when the value a1, a2, a3, and ... is acquired like drawing 3 and a5 is obtained The value which calculated the average of the value to a2-a6 when the average of the value to a1-a5 was calculated and a6 was obtained, and calculated the average of the value to a3-a7 when a7 was obtained is a value by the moving average.
[0063] Moreover, it is the approach of the approach using an oblivion multiplier carrying out the multiplication of the oblivion multiplier which is a fixed value smaller than 1 to the value acquired even at the front at a certain time, and adding the value and the value which carried out the multiplication of the value which subtracted the oblivion multiplier from 1 to the value at a certain time, and making it into this value. For example, if a block diagram shows count by this approach, the value which carried out the multiplication of the beta (oblivion multiplier) to the last output as shown in drawing 4 , and the value which carried out the multiplication of the 1-beta to this value will be added, and it will consider as this output.
[0064] Furthermore, the option which detects the magnitude of phasing is the approach of measuring the distribution or standard deviation of phasing vector variation obtained when performing channel presumption. When distribution or the standard deviation of phasing vector variation is large, it judges that phasing is large, and when distribution or a standard deviation is small, it is judged that phasing is small. It averages and asks also for distribution or standard deviation of phasing vector variation for every fixed period, asks with the moving average, or asks using an oblivion multiplier.
[0065] And in periodic or when [when a propagation-loss minimal-basis ground office is changed, or when the judgment result of the magnitude of phasing changes], a mobile station gets down from phasing information and propagation-loss minimal-basis ground office information to an uphill circuit instead of user data, and is set up as transmitted power information. Moreover, error detection information (CRC (Cyclic Redundancy Check) information) is set up as information for [this] getting down and performing error detection of a transmitted power information part (step 104). It gets down to drawing 5 and a format of a circuit and a going-up circuit is shown.

[0066] Next, actuation of a base station is explained with reference to the flow chart of drawing 6 .
[0067] A base station decodes the information included in the uphill circuit from the mobile station (step 201). And the information decoded and acquired gets down, and in being transmitted power information, it performs error detection using CRC information to phasing information and propagation-loss minimal-basis ground office information (step 202).
[0068] And it judges whether an error is not detected in error detection, but phasing of a base station is small, and a local station corresponds to a propagation-loss minimal-basis ground office (steps 202-204).
[0069] And it gets down and there is no error in transmitted power information, phasing of a base station is small, when it does not correspond to a propagation-loss minimal-basis ground office, it turns off transmission (step 205), and when other, it sets transmission to ON (step 206).
[0070] It gets down, and since [which is depended on this operation gestalt] it gets down, it gets down using the information on a circuit and the transmitted power control approach is performing transmitted power control of a circuit, it is reliable. However, since it is necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, the format for getting down from phasing information and propagation-loss minimal-basis ground office information, and transmitting as transmitted power information must be considered as a format of standard specifications.
[0071] (2nd operation gestalt) Next, the CDMA migration communication system of the 2nd operation gestalt of this invention is explained.
[0072] A base station/base station controller goes up this operation gestalt, the magnitude of phasing is judged from a circuit, and a mobile station determines a propagation-loss minimal-basis ground office from the received power of a perch channel.
[0073] First, the processing in the mobile station of this operation gestalt is explained with reference to the flow chart of drawing 7 .
[0074] The mobile station in this operation gestalt deletes the processing which the size of phasing of step 103 judges from actuation of the mobile station in the 1st operation gestalt shown with the flow chart of drawing 1 .
[0075] And periodic or when a propagation-loss minimal-basis ground office is changed, a mobile station gets down from propagation-loss minimal-basis ground office information to an uphill circuit instead of user data, and is set up as transmitted power information. Moreover, error detection information is set up as information for [this] getting down and performing error detection of a transmitted power information part (step 105).
[0076] Next, the processing in the base station/base station controller of this operation gestalt is explained with reference to the flow chart of drawing 8 .
[0077] A base station decodes the information included in the uphill circuit from the mobile station, the information decoded and acquired gets down from an uphill circuit, and in being transmitted power information, it performs error detection using CRC information to propagation-loss minimal-basis ground office information (step 201).
[0078] And a base station judges size of phasing by measuring whether it is beyond a threshold with the transmitted power control error in the going-up circuit from a mobile station. And the judgment result is transmitted to a base station controller (step 207).
[0079] And as for the base station, an error was not detected in error detection, the purport that phasing was small was notified in all base stations from the base station controller, or a local station judges whether it corresponds to a propagation-loss minimal-basis ground office (steps 202-204).
[0080] And it gets down, there is no error in transmitted power information, the purport that phasing is small is notified in all base stations from a base station controller, a base station turns off transmission, when a local station does not correspond to a propagation-loss minimal-basis ground office (step 205), and when other, it sets transmission to ON (step 206).
[0081] Moreover, although not shown in the flow chart of drawing 8 , a base station controller notifies that to each base station, when at least one judgment result that phasing is large is included by something among the judgment results of phasing notified from each base station,

and when all judgment results are as a result of [that phasing is small] a judgment, it notifies that to each base station.
[0082] It gets down, and since [which is depended on this operation gestalt] it gets down, it gets down using the information on a circuit and the transmitted power control approach is performing transmitted power control of a circuit, it is reliable. However, since it is necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, the format for getting down from propagation-loss minimal-basis ground office information, and transmitting as transmitted power information must be considered as a format of standard specifications. Moreover, in order to go up phasing information and to obtain from the propagation condition of a circuit, it will get down with an uphill circuit and the error by the difference in the frequency of a circuit will be included.
[0083] With this operation gestalt, when each base station notified the judgment result of the size of phasing to a base station controller, a base station controller was judged as phasing being small in all base stations and it corresponded to a propagation-loss minimal-basis ground office to each base station, it had permitted turning off transmission. However, each base station does not notify the result of the size of phasing to a base station controller, but judges original with each base station, and when phasing is small and a local station is not a propagation-loss minimal-basis ground office, you may make it turn off transmission. In this case, since it is not necessary to exchange control information between a base station and a base station controller, quick transmitted power control can be performed.
[0084] (3rd operation gestalt) Next, the CDMA migration communication system of the 3rd operation gestalt of this invention is explained.
[0085] A mobile station gets down, the magnitude of phasing is judged from a circuit, a base station/exchange goes up, and this operation gestalt determines a propagation-loss minimal-basis ground office from the received power of a circuit.
[0086] First, the processing in the mobile station of this operation gestalt is explained with reference to the flow chart of drawing 9 .
[0087] The mobile station in this operation gestalt deletes the processing which determines the propagation-loss minimal-basis ground office of steps 101 and 102 from actuation of the mobile station in the 1st operation gestalt shown with the flow chart of drawing 1 .
[0088] And periodic or when the judgment result of the magnitude of phasing changes, a mobile station gets down from phasing information to an uphill circuit instead of user data, and is set up as transmitted power information. Moreover, error detection information is set up as information for [this] getting down and performing error detection of a transmitted power information part (step 106).
[0089] Next, the processing in the base station/base station controller of this operation gestalt is explained with reference to the flow chart of drawing 10 .
[0090] A base station decodes the information included in the uphill circuit from the mobile station, the information decoded and acquired gets down from an uphill circuit, and in being transmitted power information, it performs error detection using CRC information to phasing information (step 201).
[0091] And a base station controller compares Eb/I0 in the communication line of each base station of a certain channel which performs a software handover, judges the base station whose Eb/I0 is max as a propagation-loss minimal-basis ground office, and notifies it to each base station by making the judgment result into propagation-loss minimal-basis ground office information (step 208).
[0092] And it judges whether an error is not detected in error detection, but phasing of a base station is small, and a local station corresponds to a propagation-loss minimal-basis ground office (steps 202-204).
[0093] And it gets down and there is no error in transmitted power information, phasing of a base station is small, when a local station does not correspond to a propagation-loss minimal-basis ground office, it turns off transmission (step 205), and when other, it sets transmission to ON (step 206).
[0094] It gets down, and since [which is depended on this operation gestalt] it gets down, it

gets down using the information on a circuit and the transmitted power control approach is performing transmitted power control of a circuit, it is reliable. However, since it is necessary to go up from a mobile station to a base station, to get down through a circuit, and to transmit transmitted power information, the format for getting down from phasing information and transmitting as transmitted power information must be considered as a format of standard specifications. Moreover, in order to go up propagation-loss minimal-basis ground office information and to obtain from the propagation condition of a circuit, it will get down with an uphill circuit and the error by the difference in the frequency of a circuit will be included. Furthermore, the information on the propagation loss in each communication line obtained in the base station is brought together in a base station controller, a propagation-loss minimal-basis ground office is determined in a base station controller, and since the information is notified to each base station, control delay will occur.

[0095] (4th operation gestalt) Next, the CDMA migration communication system of the 4th operation gestalt of this invention is explained.

[0096] A base station/base station controller goes up, the magnitude of phasing is judged from a circuit, a base station/exchange goes up, and this operation gestalt determines a propagation-loss minimal-basis ground office from the received power of a circuit.

[0097] The explanation is omitted in order that the mobile station of this operation gestalt may perform the same actuation as the mobile station which does not apply this invention.

[0098] The processing in the base station/base station controller of this operation gestalt is explained with reference to the flow chart of drawing 11 .

[0099] A base station judges size of phasing by measuring whether it is beyond a threshold with the transmitted power control error in the going-up circuit from a mobile station. And the judgment result is transmitted to a base station controller (step 207).

[0100] And a base station controller compares Eb/I0 in the communication line of each base station of a certain channel which performs a software handover, judges the base station whose Eb/I0 is max as a propagation-loss minimal-basis ground office, and notifies it to each base station by making the judgment result into propagation-loss minimal-basis ground office information (step 208).

[0101] And in all base stations, the purport that phasing was small was notified from the base station controller, or, as for a base station, a local station judges whether it corresponds to a propagation-loss minimal-basis ground office (steps 203 and 204).

[0102] And in all base stations, the purport that phasing is small is notified from a base station controller, a base station turns off transmission, when a local station does not correspond to a propagation-loss minimal-basis ground office (step 205), and when other, it sets transmission to ON (step 206).

[0103] Moreover, although not shown in the flow chart of drawing 11 , a base station controller notifies that to each base station, when at least one judgment result that phasing is large is included by something among the judgment results of phasing notified from each base station, and when all judgment results are as a result of [that phasing is small] a judgment, it notifies that to each base station.

[0104] It gets down, and since [which is depended on this operation gestalt] it is not necessary to go up from a mobile station to a base station, and to get down through a circuit and the transmitted power control approach does not need to transmit transmitted power information, it does not need to change a format of the usual specification. Moreover, in order to go up propagation-loss minimal-basis ground office information and phasing information and to obtain from the propagation condition of a circuit, it will get down with an uphill circuit and the error by the difference in the frequency of a circuit will be included. Furthermore, the information acquired in the base station is brought together in a base station controller, the decision of a propagation-loss minimal-basis ground office and the decision of phasing size are made in a base station controller, and since the information is notified to each base station, control delay will occur.

[0105] With this operation gestalt, when each base station notified the judgment result of the size of phasing to a base station controller, a base station controller was judged as phasing being

small in all base stations and it corresponded to a propagation-loss minimal-basis ground office to each base station, it had permitted turning off transmission. However, each base station does not notify the result of the size of phasing to a base station controller, but judges original with each base station, and when phasing is small and a local station is not a propagation-loss minimal-basis ground office, you may make it turn off transmission. In this case, since it is not necessary to exchange control information between a base station and a base station controller, quick transmitted power control can be performed.

[0106] (5th operation gestalt) This operation gestalt combines the 4th four operation gestalt from the above 1st. above-mentioned the 1- although the configuration of the 4th four operation gestalt operates also independently, it can enlarge the degree of freedom of a system by combining.

[0107] the following table 1 -- the 1- the difference in the 4th operation gestalt is shown.

[0108]

[Table 1]

	第１の実施形態	第２の実施形態	第３の実施形態	第４の実施形態
フェージングの大きさ	移動局が下り回線から測定	基地局が上り回線から測定	移動局が下り回線から測定	基地局が上り回線から測定
伝搬損失最小基地局	移動局がとまり木チャネルから測定	←	基地局が上り回線の受信電力から測定	←

For example, while a mobile station gets down and judging the magnitude of phasing by the circuit by combining the 1st and 4th operation gestalt, a propagation-loss minimal-basis ground office is determined from the received power of a perch channel, and while a base station/base station controller goes up and judging the size of phasing in a circuit from a circuit, a propagation-loss minimal-basis ground office is determined from the received power of an uphill circuit. And a base station/base station controller controls transmitting ON / OFF of a base station from two or more of such information.

[0109] In such a case, for example, the following three control approaches, it is.

(1) Since [which cannot get down and cannot use transmitted power information] a base station is included in an uphill circuit when an error is detected by the uphill circuit, it controls transmitting ON / OFF of a base station using the size information on phasing obtained with the base station/base station controller, and transmitting ON / OFF information.

(2) In the case of the judgment result that the both sides of the judgment result based on the information acquired from the uphill circuit and the judgment result based on the information acquired with the base station/base station controller turn off both transmission of a base station, a base station makes transmission off.

(3) the case of the judgment result that either the judgment result based on the information acquired from the uphill circuit or the judgment result based on the information acquired with the base station/base station controller turns off transmission of a base station, as for a base station -- transmission -- suppose that it is off.

[0110] Although it has the fault that a configuration becomes complicated in getting down combining two or more information like this operation gestalt and performing transmitted power control, it has the advantage in which the dependability of transmitting change control can be raised.

[0111] (6th operation gestalt) Next, the CDMA migration communication system of the 6th operation gestalt of this invention is explained.

[0112] In CDMA migration communication system, although one base station constitutes one cel, in order to attain large capacity-ization of a communication line, sector-ization is performed. This sector-ization is the approach of giving directivity to the antenna of a base station and dividing one cel into the area of plurality, such as three and six [for example,]. And the area which divided this cel is called the sector.

[0113] The CDMA migration communication system with which such sector-ization was performed is shown in drawing 12 .

[0114] Base stations 201-203 constitute cels 60-62 from drawing 12 , respectively. And the cel 60 is divided into three sectors 60a, 60b, and 60c. Moreover, cels 61 and 62 are similarly divided into three sectors.
[0115] Here, the handover performed in case it moves between the sectors from which a mobile station differs is called the SOFUTA handover.
[0116] Thus, in the sector-ized CDMA migration communication system, when it exists in the location as a mobile station 10 shows to drawing 12 , for example, in case software or a SOFUTA handover is performed, also when [eight] it gets down and a circuit is used, it may generate to one mobile station 10.
[0117] the CDMA migration communication system with which such sector-ization was performed -- receiving -- above-mentioned the 1- the case where the former will get down and software or a SOFUTA handover will be performed by eight circuits by the transmitted power control approach if the 5th operation gestalt gets down and the transmitted power control approach is applied -- one circuit -- leaving -- other circuits -- transmission -- it will be off. However, in what was performing HANDO over by eight circuits becoming only one circuit, since the difference is too large, also when phasing is small and degradation of a quality of service cannot be permitted even if, it may generate.
[0118] Therefore, this operation gestalt gets down, and by the transmitted power control approach, the propagation loss of a circuit does not consider only the minimum base station as transmitting ON, but it is made to consider all the base stations that are below constant value with the propagation loss of a communication line as transmitting ON, and when the propagation loss of all base stations is larger than constant value, a propagation loss considers only the minimum base station as transmitting ON.
[0119] By such control, also at the lowest, two or more offices where a propagation loss is usually small serve as transmitting ON, and one base station can suppress degradation of a quality of service to minimum while serving as transmitting ON.
[0120] With the 6th operation gestalt, it may get down from the above 1st, ON / off control of transmitted power may be performed per frame, and you may carry out per slot.
[0121] Moreover, although the propagation loss of a communication line was searched for with the 6th operation gestalt from the above 1st, it got down noting that the circuit between the base stations of min [propagation loss / the] was a circuit with the most sufficient condition for the mobile station, and transmitted power control was performed, the base station which uses a power level on reception instead of a propagation loss, and serves as a circuit with the most sufficient condition for the mobile station may be determined. In this case, the base station where a power level on reception is naturally the largest is determined as a base station with the sufficient condition of a circuit.
[0122] Furthermore, in case a software handover or a SOFUTA handover is performed with the 6th operation gestalt from the above 1st, as only the base station where the propagation loss in the communication line between mobile stations is the smallest communicates with the mobile station as a propagation-loss minimal-basis ground office, it gets down by turning off transmission and other base stations are reducing the channel capacity of a circuit. However, it can get down by performing control which lowers transmitted power, and this invention can acquire the same effectiveness that the channel capacity of a circuit is reducible, even if it is not limited to such control and any base stations other than a propagation-loss minimal-basis ground office do not make transmission completely off.
[0123]

[Translation done.]

* NOTICES *

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damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the flow chart which showed actuation of the mobile station in the CDMA migration communication system of the 1st operation gestalt of this invention.
[Drawing 2] It is drawing (drawing 2 (b)) showing change of the receiving level by transmitted power control when drawing (drawing 2 (a)) and phasing which show change of the receiving level by transmitted power control when phasing is large are large.
[Drawing 3] It is drawing for explaining the moving average.
[Drawing 4] It is drawing for explaining how to calculate the average with an oblivion multiplier.
[Drawing 5] It is drawing in which having got down and having shown the format of a circuit and a going-up circuit.
[Drawing 6] It is the flow chart which showed actuation of the base station in the CDMA migration communication system of the 1st operation gestalt of this invention.
[Drawing 7] It is the flow chart which showed actuation of the mobile station in the CDMA migration communication system of the 2nd operation gestalt of this invention.
[Drawing 8] It is the flow chart which showed actuation of the base station in the CDMA migration communication system of the 2nd operation gestalt of this invention.
[Drawing 9] It is the flow chart which showed actuation of the mobile station in the CDMA migration communication system of the 3rd operation gestalt of this invention.
[Drawing 10] It is the flow chart which showed actuation of the base station in the CDMA migration communication system of the 3rd operation gestalt of this invention.
[Drawing 11] It is the flow chart which showed actuation of the base station in the CDMA migration communication system of the 2nd operation gestalt of this invention.
[Drawing 12] It is drawing for explaining the sector-ized CDMA migration communication system.

[Drawing 13] It is the block diagram having shown the configuration of CDMA migration communication system.
[Drawing 14] It is the block diagram having shown the configuration of the mobile station 10 in CDMA migration communication system.
[Drawing 15] It is the block diagram having shown the configuration of the base station 201 in CDMA migration communication system.
[Drawing 16] It is drawing showing the case where it transmits by getting down from two base stations to one mobile station.
[Drawing 17] It is drawing showing the case where it transmits by getting down from one base station to one mobile station.
[Description of Notations]
10 Mobile Station
11 Demodulator
12 Analog-to-digital Converter
13 Communication Channel Rake Receiver
14 Decryption Section
151-153 Perch CH rake receiver

161-163 Perch CH receiving level test section
17 Control Section
18 Receiving Level Test Section
19 Subtractor
201 202 Base station
21 Transmitted Power Calculation Section
22 Coding Section
23 Digital-analog Converter
24 Modulator
25 Modulator
26 Digital-analog Converter
27 Coding Section
28 Transmitted Power Calculation Section
29 Control Section
30 Base Station Controller
31 ATM Switch
32 Control Section
40 Exchange
41 Receiving Level Test Section
42 Subtractor
43 Analog-to-digital Converter
44 Communication Channel Rake Receiver
45 Demodulator
46 Decryption Section
47 Get Down and They are Transmitting ON / Off Indication Signal.
51 User Information
52 Control Information
60 Cel
60a, 60b, 60c Sector
61 62 Cel
101-106 Step
201-208 Step

[Translation done.]

引用文献３

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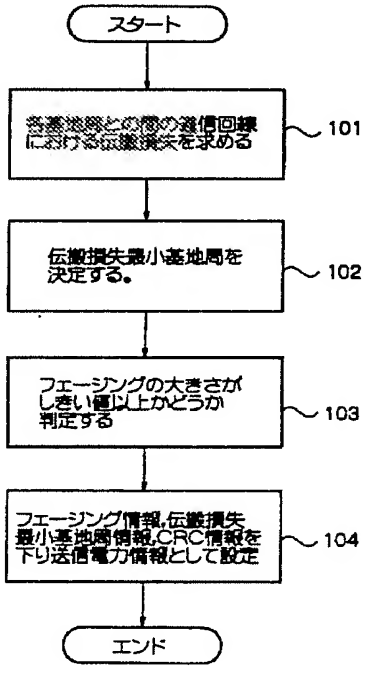
(54)【発明の名称】　ＣＤＭＡ移動通信システムおよびその下り送信電力制御方法

(57)【要約】
【課題】　ソフトハンドオーバが行われる際に、通信回線のサービス品質を悪化させずに下り回線の通信容量を削減する。
【解決手段】　移動局は、各基地局との間の回線における伝搬損失を測定し（ステップ１０１）、その値が最小である基地局を伝搬損失最小基地局とする（ステップ１０２）。さらに、移動局は回線のフェージングの大きさを測定し（ステップ１０３）、そのフェージングの大きさの情報と伝搬損失最小基地局の情報を上り回線に送信する（ステップ１０４）。基地局では、フェージングが小さく自局が伝搬損失最小基地局に該当しない場合には送信をオフする。ソフトハンドオーバ時には、フェージングが小さく通信回線の状態が良い移動局には１つの基地局のみから送信されることにより下り回線容量が削減される。



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【特許請求の範囲】

【請求項１】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、

前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局と、

を有しているＣＤＭＡ移動通信システム。

【請求項２】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記伝搬損失最小基地局情報と、前記伝搬損失最小基地局情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、

前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを判定し、該判定によりフェージングの大きさが前記しきい値より小さいと判定され、かつ前記誤り検出において誤りが検出されず、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局と、

を有しているＣＤＭＡ移動通信システム。

【請求項３】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、

ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記各基地局に通知する基地局制御装置と、

前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報に対して前記誤り検出情報を用いた誤り検出を行い、誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局と、

を有しているＣＤＭＡ移動通信システム。

【請求項４】　ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記各基地局に通知する基地局制御装置と、

前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを判定し、該判定によりフェージングの大きさが前記しきい値より小さいと判定され、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局と、

を有しているＣＤＭＡ移動通信システム。

【請求項５】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、

ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記各基地局に通知する基地局制御装置と、

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前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを判定し、該誤り検出において誤りが検出されない場合には、復号した前記下り送信電力情報に含まれていた前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ復号した前記下り送信電力情報に含まれていた伝搬損失最小基地局情報が自局が前記伝搬損失最小基地局に該当しないと示している場合には送信をオフし、前記条件以外の場合には送信をオンし、該誤り検出において誤りが検出された場合には、前記上り回線から判定したフェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ前記基地局制御装置から通知された伝搬損失最小基地局情報が自局が前記伝搬損失最小基地局に該当しないと示している場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局と、

を有しているＣＤＭＡ移動通信システム。

【請求項６】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が予め定められた基準値以下である基地局を送信をオンする基地局とし、前記基準値以下の基地局が１つも存在しない場合には該伝搬損失が最小の基地局を送信をオンする基地局とし、該送信をオンする基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、

前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局と、

を有しているＣＤＭＡ移動通信システム。

【請求項７】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、

前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信電力を下げ、前記条件以外の場合には送信電力を元の値に戻す複数の基地局と、

を有しているＣＤＭＡ移動通信システム。

【請求項８】　前記フェージングの大小の判定が、送信電力制御時の受信レベルの変動量に基づいて行われる請求項１から７のいずれか１項記載のＣＤＭＡ移動通信システム。

【請求項９】　前記フェージングの大小の判定が、目標とする受信電力と実際に受信した電力との誤差である送信電力制御誤差に基づいて行われる請求項１から７のいずれか１項記載のＣＤＭＡ移動通信システム。

【請求項１０】　前記フェージングの大小の判定が、フェージングベクトル変化量に基づいて行われる請求項１から７のいずれか１項記載のＣＤＭＡ移動通信システム。

【請求項１１】　前記下り送信電力制御がフレーム単位で行われる請求項１から１０のいずれか１項記載のＣＤＭＡ移動通信システム。

【請求項１２】　前記下り送信電力制御がスロット単位で行われる請求項１から１０のいずれか１項記載のＣＤＭＡ移動通信システム。

【請求項１３】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を移動局において求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、

前記通信回線におけるフェージングの大きさを移動局において測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、

前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送

信電力情報として前記移動局から上り回線に含めて前記各基地局に送信し、

前記各基地局では、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとするＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項１４】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を移動局において求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、

前記伝搬損失最小基地局情報と、前記伝搬損失最小基地局情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて前記移動局から前記各基地局に送信し、

前記各基地局では、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、

前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを前記基地局において判定し、

該判定によりフェージングの大きさが前記しきい値より小さいと判定され、かつ前記誤り検出において誤りが検出されず、かつ当該基地局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとするＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項１５】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を移動局において求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、

前記通信回線におけるフェージングの大きさを移動局において測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、

前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて前記移動局から前記各基地局に送信し、

ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を基地局制御装置において比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記基地局制御装置から前記各基地局に通知し、

前記基地局では、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報に対して前記誤り検出情報を用いた誤り検出を行い、誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとするＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項１６】　ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を基地局制御装置において比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記基地局制御装置から前記各基地局に通知し、

前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを前記各基地局において判定し、該判定によりフェージングの大きさが前記しきい値より小さいと判定され、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとするＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項１７】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を移動局において求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、

前記通信回線におけるフェージングの大きさを移動局において測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、

前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて前記移動局から前記各基地局に送信し、

ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を基地局制御装置において比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記基地局制御装置から前記各基地局に通知し、

前記基地局では、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情

報を用いた誤り検出を行い、前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを判定し、該誤り検出において誤りが検出されない場合には、復号した前記下り送信電力情報に含まれていた前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ復号した前記下り送信電力情報に含まれていた伝搬損失最小基地局情報が自局が前記伝搬損失最小基地局に該当しないと示している場合には送信をオフし、前記条件以外の場合には送信をオンし、該誤り検出において誤りが検出された場合には、前記上り回線から判定したフェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ前記基地局制御装置から通知された伝搬損失最小基地局情報が自局が前記伝搬損失最小基地局に該当しないと示している場合には送信をオフし、前記条件以外の場合には送信をオンとするＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項１８】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を移動局において求め、該伝搬損失が予め定められた基準値以下である基地局を送信をオンする基地局とし、前記基準値以下の基地局が１つも存在しない場合には該伝搬損失が最小の基地局を送信をオンする基地局とし、該送信をオンする基地局を示す情報である伝搬損失最小基地局情報を生成し、

前記通信回線におけるフェージングの大きさを移動局において測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、

前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて前記移動局から前記各基地局に送信し、

前記基地局では、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとするＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項１９】　ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を移動局において求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、

前記通信回線におけるフェージングの大きさを移動局において測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、

前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として前記移動局から上り回線に含めて前記各基地局に送信し、

前記各基地局では、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信電力を下げ、前記条件以外の場合には送信電力の元の値に戻すＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項２０】　前記フェージングの大小の判定が、送信電力制御時の受信レベルの変動量に基づいて行われる請求項１３から１９のいずれか１項記載のＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項２１】　前記フェージングの大小の判定が、目標とする受信電力と実際に受信した電力との誤差である送信電力制御誤差に基づいて行われる請求項１３から１９のいずれか１項記載のＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項２２】　前記フェージングの大小の判定が、フェージングベクトル変化量に基づいて行われる請求項１３から１９のいずれか１項記載のＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項２３】　前記下り送信電力制御がフレーム単位で行われる請求項１３から２２のいずれか１項記載のＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【請求項２４】　前記下り送信電力制御がスロット単位で行われる請求項１３から２２のいずれか１項記載のＣＤＭＡ移動通信システムにおける下り送信電力制御方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、移動局、基地局、基地局制御装置および交換局とから構成されるＣＤＭＡ（符号分割多元接続：Ｃｏｄｅ　Ｄｉｖｉｓｉｏｎ　ＭｕｌｔｉｐｌｅＡｃｃｅｓｓ）移動通信システムに関し、特にＣＤＭＡ移動通信システムにおける下り送信電力制御方法に関する。

【０００２】
【従来の技術】近年、移動通信システムに用いられる通信方式として、干渉や妨害に強いＣＤＭＡ通信方式が注目されている。このＣＤＭＡ通信方式とは、送信側では送信したいユーザ信号を拡散符号により拡散して送信し、受信側ではその拡散符号と同一の拡散符号を用いて逆拡散を行うことにより元のユーザ信号を得る通信システムである。
【０００３】そして、このＣＤＭＡ移動通信システムでは、複数の送信側がそれぞれ直交性を有する異なる拡散符号を使用して拡散を行ない、受信側では逆拡散を行う際に使用する拡散符号を選択することにより各通信の特定を行うことができるため、複数の通信により同一の周波数帯域を使用することができる。
【０００４】しかし、使用する全ての拡散符号の間で完全に直交性を保つことは困難であるため、実際にはそれぞれの拡散符号は完全な直交とはならず、他符号との間に相関成分を有することとなる。そのため、これらの相関成分が自通信にとっては干渉成分となり、通信品質の劣化要因となる。このような要因で干渉成分が生じるため、通信の数が増えるに従って干渉成分も増加する。そのため、ある周波数帯域において多重することができる通信回線の数は、それぞれの通信回線の送信電力が低いほど増やすことができる。
【０００５】そのため、ＣＤＭＡ移動通信システムにおける基地局はそれぞれの移動局との間に設定された通信回線により得られるＥｂ／Ｉ０（希望受信波電力（Ｅｂ）対干渉波電力（Ｉ０）比)が最低限度の通信品質を確保するために必要なＥｂ／Ｉ０（以下所要Ｅｂ／Ｉ０と呼ぶ）となるように各移動局の送信電力の制御を行なっている。この送信電力制御を上り送信電力制御という。
【０００６】具体的には、基地局から移動局に送信される下り回線に移動局に対して送信電力のアップ／ダウンを指示するためのＴＰＣ（Ｔｒａｎｓｍｉｓｓｉｏｎ Ｐｏｗｅｒ Ｃｏｎｔｏｒｏｌｌ：送信電力制御）情報が含まれており、基地局はこのＴＰＣ情報により各移動局に対して現在の送信電力のアップまたはダウン指示を行なっている。
【０００７】このようなＣＤＭＡ移動通信システムの構成を図１３に示す。
【０００８】このＣＤＭＡ移動通信システムは、交換局４０と、基地局制御装置３０と、基地局20_1、20_2と、移動局１０とから構成されている。
【０００９】交換局４０には、実際には基地局制御装置３０以外の基地局制御装置が接続され、基地局制御装置３０には実際には基地局20_1、20_2以外の基地局が接続され、基地局20_1、20_2は移動局１０以外の移動局とも実際には通信を行なっているが、ここでは説明を簡単にするため省略する。
【００１０】また、基地局制御装置３０は、ＡＴＭ（Ａｓｙｎｃｈｒｏｎｏｕｓ Ｔｒａｎｓｆｅｒ Ｍｏｄｅ：非同期転送モード）スイッチ３１と、制御部３２とを有している。
【００１１】ＡＴＭスイッチ３１は、交換局からのＡＴＭセルをユーザ情報５１として、行き先アドレスに従って基地局20_1または基地局20_2に送信している。
【００１２】制御部３２は、基地局20_1、20_2の動作を制御するための制御情報５２を基地局20_1、20_2に送信している。
【００１３】図１４は、ＣＤＭＡ移動通信システムにおける移動局１０の構成を示すブロック図である。
【００１４】移動局１０は、復調器１１と、アナログデジタル変換器１２と、通信チャネルレイク受信機１３と、復号化部１４と、止まり木ＣＨレイク受信機15_1～15_3と、止まり木ＣＨ受信レベル測定部16_1～16_3と、制御部１７と、受信レベル測定部１８と、減算器１９と、送信電力計算部２１と、符号化部２２と、デジタルアナログ変換器２３と、変調器２４とから構成されている。
【００１５】移動局１０では、受信された下り回線は先ず復調器１１において復調されベースバンド信号に変換され、アナログデジタル変換器１２においてデジタル信号に変換される。そして、そのデジタル信号は、通信チャネルレイク受信機１３においてレイク合成され、復号化部１４において復号され受信ユーザ情報が抽出される。
【００１６】また、通信チャネルレイク受信機１３においてレイク合成された後の信号は受信レベル測定部１８においてその受信レベルが測定される。
【００１７】また、アナログデジタル変換器１２からのデジタル信号は、止まり木ＣＨレイク受信機15_1～15_3、止まり木ＣＨ受信レベル測定部16_1～16_3に入力されることにより複数の基地局から受信した止まり木ＣＨ受信レベルが測定され、制御部１７に伝達される。
【００１８】また、減算器１９では、受信レベル測定部１８において測定された通信チャネルの受信レベルと制御部１７からの目標レベルのと間の差が演算される。そして、その演算結果は送信電力計算部２１に入力され下り送信電力情報に変換される。
【００１９】送信ユーザ情報は、符号化部２２において符号化され、デジタルアナログ変換器２３において送信電力計算部２１において求められた下り送信電力情報とともにアナログ信号に変換される。そして、そのアナログ信号は変調器２４において変調された後に上り回線（移動局から基地局への通信回線）として基地局に送信される。
【００２０】図１５は、ＣＤＭＡ移動通信システムにおける基地局20_1の構成を示したブロック図である。
【００２１】この基地局20_1は、変調器２５と、デジ

タルアナログ変換器２６と、符号化部２７と、送信電力計算部２８と、制御部２９と、受信レベル測定部４１と、減算器４２と、アナログデジタル変換器４３と、通信チャネルレイク受信機４４と、復調器４５と、復号化部４６とから構成されている。

【００２２】基地局２０$_1$では、受信した上り回線は、復調器４５で復調されアナログデジタル変換器４３においてデジタル信号に変換され、通信チャネルレイク受信機４４においてレイク合成され、復号化部４６において復号され受信ユーザ情報として抽出される。

【００２３】また、通信チャネルレイク受信機４４においてレイク合成された後の信号は受信レベル測定部４１においてその受信レベルが測定される。

【００２４】また、減算器４２では、受信レベル測定部４１において測定された通信チャネルの受信レベルと制御部２９からの目標レベルのと間の差が演算される。そして、その演算結果は送信電力計算部２８に入力され制御部２９からの下り送信オン／オフ指示信号４７とともに下り送信電力情報に変換される。

【００２５】また、送信ユーザ情報は、符号化部２７において符号化され、デジタルアナログ変換器２６において、送信電力計算部２８において求められた下り送信電力情報に基づいてアナログ信号に変換される。そして、このアナログ信号は変調器２５において変調され下り回線として送信される。

【００２６】このようなＣＤＭＡ移動通信システムでは、基地局は移動局と通信を行うことができる範囲であるセルを構成している。そして、移動局はある基地局との間で通信回線を設定しながら移動してその基地局のセルの外に出てしまう場合には、移動先のセルを構成している他の基地局と間で新たな通信回線を設定するハンドオーバを行なわなければならない。

【００２７】スペクトラム拡散方式による移動通信システムは、基地局間ハンドオーバをおこなう場合に瞬断等を回避してサービス品質を保つためにソフトハンドオーバを行なっている。図１６に示すように、ソフトハンドオーバは、１つの移動局１０が複数の基地局２０$_1$、２０$_2$と同時に通信を行うもので、同一無線周波数を使用できるスペクトラム拡散通信特有の機能である。

【００２８】しかし、ソフトハンドオーバが行われる時には、複数の基地局から下り回線に同じ情報を送信するため、１通信あたりの下り回線の送信電力が多くなり、その結果、他の通信に与える干渉電力が増え、通信容量の制約となっている。

【００２９】このような制約を改善するために、図１７に示すように、ソフトハンドオーバ時に下り送信を最も伝搬損失の少ない１つの基地局から送信することにより、１通信あたりの下り回線の送信電力を減らす方法が、例えば下記の文献に提案されている。

【００３０】文献：古川[日本電気]"ＤＳ－ＣＤＭＡセルラーシステムの下り回線における基地局選択型電力送信制御"　電子情報通信学会通信ソサエティ大会　Ｂ－５－１１８　１９９８年３月しかし、この従来の下り送信電力制御方法では、ソフトハンドオーバ時は常に１つの基地局のみからしか送信が行われないため、通信回線におけるフェージングが大きい場合には、ユーザ品質を確保することができない。

【００３１】マルチメディア通信において、ネットワーク側にあるデータベースなどから大容量のデータを移動局に送る割合が多いと予測されている。今後マルチメディア通信の比重が大きくなると、上り回線に比べ、下り回線の無線回線容量を増やすことが必要とされているため、これらの下り回線の送信電力を減らす方法の必要性がある。

【００３２】なお、移動局から基地局への通信回線である上り回線は、常時１通信あたり１送信であり、複数の基地局で受信することにより、ソフトハンドオーバの効果を得ているのでソフトハンドオーバが行われる時に送信電力が増加するというような問題は発生しない。

【００３３】

【発明が解決しようとする課題】上述した従来のＣＤＭＡ移動通信システムでは、ソフトハンドオーバが行われると、１通信あたりの下り回線の送信電力が多くなり、他の通信に与える干渉電力が増え、下り回線の通信容量の制約となるという問題点があった。

【００３４】本発明の目的は、ソフトハンドオーバが行われる際に、通信回線のサービス品質を悪化させずに下り回線の通信容量を削減することができるＣＤＭＡ移動通信システムを提供することである。

【００３５】

【課題を解決するための手段】上記目的を達成するために、本発明のＣＤＭＡ移動通信システムは、ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、

かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局とを有している。

【００３６】本発明では、移動局は、各基地局との間の回線における伝搬損失を測定し、その値が最小である基地局を伝搬損失最小基地局とし、通信回線のフェージングの大きさを測定し、そのフェージング情報と伝搬損失最小基地局情報を上り回線に送信する。そして、基地局では、フェージングが小さく自局が伝搬損失最小基地局に該当しない場合には送信をオフするようにしたものである。

【００３７】したがって、ソフトハンドオーバが行われる際には、フェージングが小さく通信回線の状態が良い移動局には１つの基地局のみから送信が行われ、フェージングが大きく通信回線の状態が悪い移動局には複数の基地局から送信が行われるので通信品質を保ったまま下り回線容量を削減することができる。

【００３８】また、本発明の他のＣＤＭＡ移動通信システムは、ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記伝搬損失最小基地局情報と、前記伝搬損失最小基地局情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを判定し、該判定によりフェージングの大きさが前記しきい値より小さいと判定され、かつ前記誤り検出において誤りが検出されず、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局とを有している。

【００３９】本発明では、通信回線のフェージングは移動局でなく基地局が上り回線から測定するようにしたものである。

【００４０】また、本発明の他のＣＤＭＡ移動通信システムは、ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記各基地局に通知する基地局制御装置と、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報に対して前記誤り検出情報を用いた誤り検出を行い、誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局とを有している。

【００４１】本発明では、移動局が伝搬損失最小基地局を決定するのではなく、基地局および基地局制御装置が上り回線の受信電力から測定するようにしたものである。

【００４２】また、本発明の他のＣＤＭＡ移動通信システムは、ソフトハンドオーバを行う前記各基地局の通信回線におけるＥｂ／Ｉ０を比較し、該Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、該判定結果を伝搬損失最小基地局情報として前記各基地局に通知する基地局制御装置と、前記上り回線からフェージングの大きさが予め定められたしきい値より大きいかどうかを判定し、該判定によりフェージングの大きさが前記しきい値より小さいと判定され、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信をオフし、前記条件以外の場合には送信をオンとする複数の基地局とを有している。

【００４３】本発明では、移動局が伝搬損失最小基地局を決定するのではなく、基地局および基地局制御装置が上り回線の受信電力から測定するようにし、通信回線のフェージングは移動局でなく基地局が上り回線から測定するようにしたものである。

【００４４】したがって、移動局から基地局に上り回線を介して下り送信電力情報を伝達する必要がないため、上り回線の通常の仕様のフォーマットを変更する必要がない。

【００４５】また、本発明の他のＣＤＭＡ移動通信システムは、ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と実際に受信した止まり木チャネルの受信電力との差から前記各基地局との間に設定されている通信回線の伝搬損失を求め、該伝搬損失が最小である基地局を示す情報である伝搬損失最小基地局情報を生成し、前記通信回線におけるフェージングの大きさを測定し、該フェージングの大きさの値が予め定められたしきい値より大きいかどうかを判定した結果をフェージング情報として生成し、前記伝搬損失最

小基地局情報と、前記フェージング情報と、前記伝搬損失最小基地局情報および前記フェージング情報の誤り検出を行うための誤り検出情報とを下り送信電力情報として上り回線に含めて送信している移動局と、前記移動局からの上り回線に含まれている下り送信電力情報を復号し、前記フェージング情報と前記伝搬損失最小基地局情報に対して前記誤り検出情報を用いた誤り検出を行い、該誤り検出において誤りが検出されず、かつ前記フェージング情報がフェージングの大きさが前記しきい値より小さいことを示し、かつ自局が前記伝搬損失最小基地局に該当しない場合には送信電力を下げ、前記条件以外の場合には送信電力を元の値に戻す複数の基地局とを有している。

【００４６】本発明は、フェージングが小さい場合に、自局が伝搬損失最小基地局に該当しない場合には送信電力を下げ、自局が伝搬損失最小基地局に該当する場合には送信電力を元に戻すような制御を行うようにしているので、通信品質を保ったまま下り回線容量を削減することができる。

【００４７】

【発明の実施の形態】次に、本発明の実施の形態について図面を参照して詳細に説明する。

【００４８】以下に説明する本発明の第１から第５の実施形態は、複数の基地局が１つの移動局に対して同一内容の送信を行うソフトハンドオーバが行われる場合、下り回線のフェージングが小さい場合には複数の基地局の中でその移動局との間の通信回線における伝搬損失が最も小さい基地局のみがその移動局と通信を行うようにして他の基地局は送信をオフとするようにするものである。

【００４９】静止している状態等のフェージングの影響が少ない環境の移動局に対しては、複数の基地局から送信することにより得られる効果が少ない。高速電力制御により受信電力を一定に保つ制御の効果の大きい低速フェージング下では、所要の無線品質を得るための所要Ｅｂ／Ｉ０を小さくすることができるため、下り送信を最も伝搬損失の少ない１基地局から送信してもサービス品質を劣化させることはない。

【００５０】そのため、基地局との通信回線におけるフェージングが大きい場合には複数の基地局からの同一の信号を移動局に対して送信することにより受信特性を確保し、フェージングの小さい移動局には１つの基地局から送信することにより、サービス品質を保ったままで下り回線の干渉を減少させることによる下り回線容量を削減することができる。

【００５１】そして、以下の第１～第４の実施形態は、フェージングの大きさの測定、伝搬損失最小基地局の決定をどこで行うかがそれぞれ異なっている。

【００５２】（第１の実施形態）先ず本発明の第１の実施形態のＣＤＭＡ移動通信システムについて図１～図６を参照して説明する。

【００５３】本実施形態は、移動局が下り回線におけるフェージングの大きさを判断し、移動局が止まり木チャネルの受信電力から伝搬損失最小基地局を検出するものである。

【００５４】図１は、本実施形態のＣＤＭＡ移動通信システムにおける移動局の動作を示したフローチャートである。

【００５５】移動局は、ソフトハンドーオーバを行う各基地局から報知された止まり木チャネルの送信電力値と、実際に受信した止まり木チャネルの受信電力との差から、各基地局との間に設定されている各通信回線の伝搬損失を求める（ステップ１０１）。

【００５６】そして、移動局は、各基地局の中で測定した伝搬損失が最小である基地局を伝搬損失最小基地局として決定する（ステップ１０２）。

【００５７】そして、移動局は、送信電力制御誤差をある閾値と比べることによりフェージングが大きいかどうかを判定する（ステップ１０３）。

【００５８】ここで、図２を参照してフェージングの大小の判定を行う具体的な方法について説明する。

【００５９】ある通信回線におけるフェージング量を検出するには、送信電力制御時の受信レベルの変動量、または目標とする受信電力と実際に受信した電力との誤差である送信電力制御誤差を測定して一般にその分散又は標準偏差を求めることにより行われる。

【００６０】図２（ｂ）に示すように、通信回線におけるフェージングが緩やかな場合は高速電力制御により受信電力を一定に保つことができるので受信レベル変動量または送信電力制御誤差は小さくなるが、図２（ａ）に示すようにフェージング変動が大きい場合は正確に高速電力制御により受信電力を一定に保つことができなくなるため受信レベル変動量または送信電力制御誤差が大きくなるからである。

【００６１】また、受信レベル変動量または送信電力制御誤差は、一定周期毎に平均して求めるか、移動平均により求めるか、忘却係数を用いて求められる。

【００６２】ここで、移動平均とは、ある時点の値とその時点から一定期間前の間に存在する複数の時点の値の間の平均を求めることをいう。例えば、図３のようにa_1、a_2、a_3、・・・という値が得られた場合に、a_3が得られた時点では、a_1～a_3までの値の平均値を求め、a_4が得られた時点では、a_2～a_4までの値の平均値を求め、a_7が得られた時点では、a_5～a_7までの値の平均値を求めた値が移動平均による値である。

【００６３】また、忘却係数を用いた方法とは、ある時点の前までに得られた値に１より小さい一定の値である忘却係数を乗算し、その値と、ある時点における値に１から忘却係数を減算した値を乗算した値とを加算して今回の値とする方法である。例えば、この方法による計算

をブロック図により示すと、図４に示すように前回の出力にβ（忘却係数）を乗算した値と今回の値に１－βを乗算した値を加算して今回の出力とするものである。

【００６４】さらに、フェージングの大きさを検出する別の方法は、チャネル推定を行うときに得られるフェージングベクトル変化量の分散又は標準偏差を測定する方法である。フェージングベクトル変化量の分散又は標準偏差が大きい場合はフェージングが大きいと判断し、分散又は標準偏差が小さい場合はフェージングが小さいと判断する。フェージングベクトル変化量の分散又は標準偏差も、一定周期毎に平均して求めるか、移動平均により求めるか、忘却係数を用いて求められる。

【００６５】そして、移動局は、周期的、または、伝搬損失最小基地局が変更された際、または、フェージングの大きさの判定結果が変化した際に、上り回線にユーザデータの替わりにフェージング情報と伝搬損失最小基地局情報を下り送信電力情報として設定する。また、この下り送信電力情報部分の誤り検出を行うための情報として誤り検出情報（ＣＲＣ（Ｃｙｃｌｉｃ　Ｒｅｄｕｎｄａｎｃｙ　Ｃｈｅｃｋ）情報）を設定する（ステップ１０４）。図５に下り回線および上り回線のフォーマットを示す。

【００６６】次に、基地局の動作について図６のフローチャートを参照して説明する。

【００６７】基地局は、移動局からの上り回線に含まれている情報を復号する（ステップ２０１）。そして、復号して得られた情報が下り送信電力情報の場合にはフェージング情報と伝搬損失最小基地局情報に対してＣＲＣ情報を用いた誤り検出を行う（ステップ２０２）。

【００６８】そして、基地局は、誤り検出において誤りが検出されず、フェージングが小さく、自局が伝搬損失最小基地局に該当しないかどうかの判定を行う（ステップ２０２～２０４）。

【００６９】そして、基地局は、下り送信電力情報に誤りがなく、フェージングが小さく、伝搬損失最小基地局に該当しない場合は送信をオフし（ステップ２０５）、それ以外の場合には送信をオンとする（ステップ２０６）。

【００７０】本実施形態による下り送信電力制御方法は、下り回線の情報を用いて下り回線の送信電力制御を行っているため信頼性が高い。しかし、移動局から基地局に上り回線を介して下り送信電力情報を伝達する必要があるため、フェージング情報、伝搬損失最小基地局情報を下り送信電力情報として送信するためのフォーマットを標準仕様のフォーマットとしなければならない。

【００７１】（第２の実施形態）次に、本発明の第２の実施形態のＣＤＭＡ移動通信システムについて説明する。

【００７２】本実施形態は、基地局/基地局制御装置が上り回線からフェージングの大きさを判断し、移動局が止まり木チャネルの受信電力から伝搬損失最小基地局を決定するものである。

【００７３】先ず、本実施形態の移動局における処理を図７のフローチャートを参照して説明する。

【００７４】本実施形態における移動局は、図１のフローチャートにより示した第１の実施形態における移動局の動作からステップ１０３のフェージングの大小の判定する処理を削除したものである。

【００７５】そして、移動局は、周期的、または、伝搬損失最小基地局が変更された際に、上り回線にユーザデータの替わりに伝搬損失最小基地局情報を下り送信電力情報として設定する。また、この下り送信電力情報部分の誤り検出を行うための情報として誤り検出情報を設定する（ステップ１０５）。

【００７６】次に、本実施形態の基地局／基地局制御装置における処理を図８のフローチャートを参照して説明する。

【００７７】基地局は、移動局からの上り回線に含まれている情報を復号し、上り回線を復号して得られた情報が下り送信電力情報の場合には伝搬損失最小基地局情報に対してＣＲＣ情報を用いた誤り検出を行う（ステップ２０１）。

【００７８】そして、基地局は、移動局からの上り回線における送信電力制御誤差がある閾値以上かどうかを測定することによりフェージングの大小の判定を行う。そして、その判定結果を基地局制御装置に伝達する（ステップ２０７）。

【００７９】そして、基地局は、誤り検出において誤りが検出されず、基地局制御装置から全ての基地局においてフェージングが小さい旨が通知されたか、自局が伝搬損失最小基地局に該当しないかどうかの判定を行う（ステップ２０２～２０４）。

【００８０】そして、基地局は、下り送信電力情報に誤りがなく、基地局制御装置から全ての基地局においてフェージングが小さい旨が通知され、自局が伝搬損失最小基地局に該当しない場合には送信をオフし（ステップ２０５）、それ以外の場合には送信をオンとする（ステップ２０６）。

【００８１】また、図８のフローチャートには示されていないが、基地局制御装置は、各基地局から通知されたフェージングの判定結果のうちどれか１つでもフェージングが大きいという判定結果が含まれている場合にはその旨を各基地局に通知し、全ての判定結果がフェージングが小さいという判定結果の場合にはその旨を各基地局に通知する。

【００８２】本実施形態による下り送信電力制御方法は、下り回線の情報を用いて下り回線の送信電力制御を行っているため信頼性が高い。しかし、移動局から基地局に上り回線を介して下り送信電力情報を伝達する必要があるため、伝搬損失最小基地局情報を下り送信電力情

報として送信するためのフォーマットを標準仕様のフォーマットとしなければならない。また、フェージング情報を上り回線の伝搬状態から得るため、上り回線と下り回線の周波数の違いによる誤差が含まれてしまう。

【００８３】本実施形態では、各基地局がフェージングの大小の判定結果を基地局制御装置に通知し、基地局制御装置が全ての基地局においてフェージングが小さいと判定された場合のみ各基地局に対して伝搬損失最小基地局に該当した場合に送信をオフすることを許可していた。しかし、各基地局は、フェージングの大小の結果を基地局制御装置に通知せず、各基地局独自に判断を行ない、フェージングが小さく自局が伝搬損失最小基地局でない場合には送信をオフするようにしてもよい。この場合には、基地局と基地局制御装置との間での制御情報のやりとりを行う必要がないため迅速な送信電力制御を行うことができる。

【００８４】（第３の実施形態）次に、本発明の第３の実施形態のＣＤＭＡ移動通信システムについて説明する。

【００８５】本実施形態は、移動局が下り回線からフェージングの大きさを判断し、基地局/交換局が上り回線の受信電力から伝搬損失最小基地局を決定するものである。

【００８６】先ず、本実施形態の移動局における処理を図９のフローチャートを参照して説明する。

【００８７】本実施形態における移動局は、図１のフローチャートにより示した第１の実施形態における移動局の動作からステップ１０１、１０２の伝搬損失最小基地局を決定する処理を削除したものである。

【００８８】そして、移動局は、周期的、または、フェージングの大きさの判定結果が変化した際に、上り回線にユーザデータの替わりにフェージング情報を下り送信電力情報として設定する。また、この下り送信電力情報部分の誤り検出を行うための情報として誤り検出情報を設定する（ステップ１０６）。

【００８９】次に、本実施形態の基地局／基地局制御装置における処理を図１０のフローチャートを参照して説明する。

【００９０】基地局は、移動局からの上り回線に含まれている情報を復号し、上り回線を復号して得られた情報が下り送信電力情報の場合にはフェージング情報に対してＣＲＣ情報を用いた誤り検出を行う（ステップ２０１）。

【００９１】そして、基地局制御装置は、ソフトハンドオーバを行うあるチャネルの各基地局の通信回線におけるＥｂ／Ｉ０を比較し、Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、その判定結果を伝搬損失最小基地局情報として各基地局に通知する（ステップ２０８）。

【００９２】そして、基地局は、誤り検出において誤りが検出されず、フェージングが小さく、自局が伝搬損失最小基地局に該当しないかどうかの判定を行う（ステップ２０２～２０４）。

【００９３】そして、基地局は、下り送信電力情報に誤りがなく、フェージングが小さく、自局が伝搬損失最小基地局に該当しない場合には送信をオフし（ステップ２０５）、それ以外の場合には送信をオンとする（ステップ２０６）。

【００９４】本実施形態による下り送信電力制御方法は、下り回線の情報を用いて下り回線の送信電力制御を行っているため信頼性が高い。しかし、移動局から基地局に上り回線を介して下り送信電力情報を伝達する必要があるため、フェージング情報を下り送信電力情報として送信するためのフォーマットを標準仕様のフォーマットとしなければならない。また、伝搬損失最小基地局情報を上り回線の伝搬状態から得るため、上り回線と下り回線の周波数の違いによる誤差が含まれてしまう。さらに、基地局で得た各通信回線における伝搬損失の情報を基地局制御装置に集め、基地局制御装置において伝搬損失最小基地局を決定し、その情報を各基地局に通知するので制御遅延が発生してしまう。

【００９５】（第４の実施形態）次に、本発明の第４の実施形態のＣＤＭＡ移動通信システムについて説明する。

【００９６】本実施形態は、基地局／基地局制御装置が上り回線からフェージングの大きさを判断し、基地局/交換局が上り回線の受信電力から伝搬損失最小基地局を決定するものである。

【００９７】本実施形態の移動局は、本発明を適用しない移動局と同様な動作を行うためその説明は省略する。

【００９８】本実施形態の基地局／基地局制御装置における処理を図１１のフローチャートを参照して説明する。

【００９９】基地局は、移動局からの上り回線における送信電力制御誤差がある閾値以上かどうかを測定することによりフェージングの大小の判定を行う。そして、その判定結果を基地局制御装置に伝達する（ステップ２０７）。

【０１００】そして、基地局制御装置は、ソフトハンドオーバを行うあるチャネルの各基地局の通信回線におけるＥｂ／Ｉ０を比較し、Ｅｂ／Ｉ０が最大である基地局を伝搬損失最小基地局として判定し、その判定結果を伝搬損失最小基地局情報として各基地局に通知する（ステップ２０８）。

【０１０１】そして、基地局は、基地局制御装置から全ての基地局においてフェージングが小さい旨が通知されたか、自局が伝搬損失最小基地局に該当しないかどうかの判定を行う（ステップ２０３、２０４）。

【０１０２】そして、基地局は、基地局制御装置から全ての基地局においてフェージングが小さい旨が通知さ

れ、自局が伝搬損失最小基地局に該当しない場合には送信をオフし（ステップ２０５）、それ以外の場合には送信をオンとする（ステップ２０６）。

【０１０３】また、図１１のフローチャートには示されていないが、基地局制御装置は、各基地局から通知されたフェージングの判定結果のうちどれか１つでもフェージングが大きいという判定結果が含まれている場合にはその旨を各基地局に通知し、全ての判定結果がフェージングが小さいという判定結果の場合にはその旨を各基地局に通知する。

【０１０４】本実施形態による下り送信電力制御方法は、移動局から基地局に上り回線を介して下り送信電力情報を伝達する必要がないため、通常の仕様のフォーマットを変更する必要がない。また、伝搬損失最小基地局情報およびフェージング情報を上り回線の伝搬状態から得るため、上り回線と下り回線の周波数の違いによる誤差が含まれてしまう。さらに、基地局で得た情報を基地局制御装置に集め、基地局制御装置において伝搬損失最小基地局の決定、フェージング大小の決定を行ない、その情報を各基地局に通知するので制御遅延が発生してしまう。

＊【０１０５】本実施形態では、各基地局がフェージングの大小の判定結果を基地局制御装置に通知し、基地局制御装置が全ての基地局においてフェージングが小さいと判定された場合のみ各基地局に対して伝搬損失最小基地局に該当した場合に送信をオフすることを許可していた。しかし、各基地局は、フェージングの大小の結果を基地局制御装置に通知せず、各基地局独自に判断を行ない、フェージングが小さく自局が伝搬損失最小基地局でない場合には送信をオフするようにしてもよい。この場合には、基地局と基地局制御装置との間での制御情報のやりとりを行う必要がないため迅速な送信電力制御を行うことができる。

【０１０６】（第５の実施形態）本実施形態は、上記第１から第４の４つの実施形態を組み合わせたものである。上記第１～第４の４つの実施形態の構成は独立にも動作するが、組み合わせることによりシステムの自由度を大きくすることができる。

【０１０７】下記の表１に第１～第４の実施形態の差異を示す。

【０１０８】

＊【表１】

	第１の実施形態	第２の実施形態	第３の実施形態	第４の実施形態
フェージングの大きさ	移動局が下り回線から測定	基地局が上り回線から測定	移動局が下り回線から測定	基地局が上り回線から測定
伝搬損失最小基地局	移動局がとまり木チャネルから測定	←	基地局が上り回線の受信電力から測定	←

例えば、第１と第４の実施形態を組み合わせることにより、移動局が下り回線でフェージングの大きさを判断するとともに止まり木チャネルの受信電力から伝搬損失最小基地局を決定し、また、基地局／基地局制御装置が上り回線から回線におけるフェージングの大小を判断するとともに、上り回線の受信電力から伝搬損失最小基地局を決定する。そして、基地局／基地局制御装置は、これらの複数の情報から基地局の送信オン／オフを制御する。

【０１０９】このような場合、例えば以下の３つの制御方法がある。

（１）基地局は、上り回線に誤りが検出された場合、上り回線に含まれる下り送信電力情報を使用することができないため、基地局/基地局制御装置で得たフェージングの大小情報、送信オン／オフ情報を用いて基地局の送信オン／オフを制御する。

（２）基地局は、上り回線から得た情報に基づいた判定結果、および基地局／基地局制御装置で得た情報に基づいた判定結果の双方が、ともに基地局の送信をオフするという判定結果の場合に送信をオフとする。

（３）基地局は、上り回線から得た情報に基づいた判定結果、または基地局／基地局制御装置で得た情報に基づいた判定結果のどちらかが基地局の送信をオフするという判定結果の場合に送信オフとする。

【０１１０】本実施形態のように複数の情報を組み合わせて下り送信電力制御を行う場合には構成が複雑になるという欠点を有するが、送信切替制御の信頼性を向上させることができるという長所を有する。

【０１１１】（第６の実施形態）次に、本発明の第６の実施形態のＣＤＭＡ移動通信システムについて説明する。

【０１１２】ＣＤＭＡ移動通信システムでは、１つの基地局は１つのセルを構成しているが、通信回線の大容量化を図るために、セクタ化が行われている。このセクタ化とは、基地局のアンテナに指向性を持たせ、１つのセルを複数（例えば３つ、６つ等）のエリアに分割する方法である。そして、このセルを分割したエリアはセクタと呼ばれている。

【０１１３】このようなセクタ化が行われたＣＤＭＡ移動通信システムを図１２に示す。

【０１１４】図１２では、基地局20_1～20_3が、それぞれセル６０～６２を構成している。そして、セル６０は、３つのセクタ６０ａ、６０ｂ、６０ｃに分割されている。また、セル６１、６２も同様に３つのセクタに分割されている。

【０１１５】ここで、移動局が異なるセクタ間を移動す

る際に行われるハンドオーバはソフターハンドオーバと呼ばれている。

【０１１６】このようにセクタ化されたＣＤＭＡ移動通信システムでは、例えば移動局１０が図１２に示すような位置に存在している場合には、ソフト又はソフターハンドオーバが行われる際には１つの移動局１０に対して８つの下り回線が用いられるような場合も発生し得る。

【０１１７】このようなセクタ化が行われたＣＤＭＡ移動通信システムに対して、上記第１～第５の実施形態の下り送信電力制御方法を適用すると、従来の下り送信電力制御方法では８つの回線によりソフト又はソフターハンドオーバが行われる場合でも、１つの回線のみを残して他の回線では送信オフとなってしまう。しかし、８つの回線によりハンドーオーバを行なっていたものが、１つの回線のみとなってしまうのではその差が大きすぎるため、たとえフェージングが小さい場合でもサービス品質の劣化が許容できない場合も発生し得る。

【０１１８】そのため、本実施形態の下り送信電力制御方法では、回線の伝搬損失が最小の基地局のみを送信オンとするのではなく、通信回線の伝搬損失がある一定値以下である基地局は全て送信オンとするようにし、全ての基地局の伝搬損失が一定値より大きい場合には伝搬損失が最小の基地局のみを送信オンとする。

【０１１９】このような制御により、最低でも１つの基地局は送信オンとなるとともに、通常は伝搬損失が小さい複数の局が送信オンとなりサービス品質の劣化を最低限に抑えることができる。

【０１２０】上記第１から第６の実施形態では、下り送信電力のオン／オフ制御はフレーム単位で行なってもよいしスロット単位で行なってもよい。

【０１２１】また、上記第１から第６の実施形態では、通信回線の伝搬損失を求め、その伝搬損失が最小の基地局との間の回線が移動局にとって最も状態の良い回線であるとして下り送信電力制御を行なっていたが、伝搬損失の代わりに受信電力レベルを用いてその移動局にとって最も状態の良い回線となる基地局を決定してもよい。この場合には、当然受信電力レベルが最も大きい基地局が回線の状態が良い基地局として決定される。

【０１２２】さらに、上記第１から第６の実施形態では、ソフトハンドオーバ又はソフターハンドオーバが行われる際に、移動局との間の通信回線における伝搬損失が最も小さい基地局のみが伝搬損失最小基地局としてその移動局と通信を行うようにして他の基地局は送信をオフすることにより下り回線の通信容量を削減している。しかし、本発明はこのような制御に限定されるものではなく、伝搬損失最小基地局以外の基地局が送信を完全にオフとしなくても、送信電力を下げる制御を行なうことにより下り回線の通信容量を削減することができるという同様な効果を得ることができる。

【０１２３】

【発明の効果】以上説明したように、本発明は、ソフト又はソフターハンドオーバが行われる際に、通信回線のサービス品質を悪化させずに下り回線の通信容量を削減することができるという効果を有する。

【図面の簡単な説明】

【図１】本発明の第１の実施形態のＣＤＭＡ移動通信システムにおける移動局の動作を示したフローチャートである。

【図２】フェージングが大きい場合の送信電力制御による受信レベルの変化を示す図（図２（ａ））、フェージングが大きい場合の送信電力制御による受信レベルの変化を示す図（図２（ｂ））である。

【図３】移動平均を説明するための図である。

【図４】忘却係数によって平均値を求める方法を説明するための図である。

【図５】下り回線および上り回線のフォーマットを示した図である。

【図６】本発明の第１の実施形態のＣＤＭＡ移動通信システムにおける基地局の動作を示したフローチャートである。

【図７】本発明の第２の実施形態のＣＤＭＡ移動通信システムにおける移動局の動作を示したフローチャートである。

【図８】本発明の第２の実施形態のＣＤＭＡ移動通信システムにおける基地局の動作を示したフローチャートである。

【図９】本発明の第３の実施形態のＣＤＭＡ移動通信システムにおける移動局の動作を示したフローチャートである。

【図１０】本発明の第３の実施形態のＣＤＭＡ移動通信システムにおける基地局の動作を示したフローチャートである。

【図１１】本発明の第２の実施形態のＣＤＭＡ移動通信システムにおける基地局の動作を示したフローチャートである。

【図１２】セクタ化されたＣＤＭＡ移動通信システムを説明するための図である。

【図１３】ＣＤＭＡ移動通信システムの構成を示したブロック図である。

【図１４】ＣＤＭＡ移動通信システムにおける移動局１０の構成を示したブロック図である。

【図１５】ＣＤＭＡ移動通信システムにおける基地局20_1の構成を示したブロック図である。

【図１６】２つの基地局から１つの移動局に対して下り送信を行う場合を示す図である。

【図１７】１つの基地局から１つの移動局に対して下り送信を行う場合を示す図である。

【符号の説明】

１０　　移動局

１１　　復調器

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１２　アナログデジタル変換器
１３　通信チャネルレイク受信機
１４　復号化部
15_1～15_3　止まり木ＣＨレイク受信機
16_1～16_3　止まり木ＣＨ受信レベル測定部
１７　制御部
１８　受信レベル測定部
１９　減算器
20_1、20_2　基地局
２１　送信電力計算部
２２　符号化部
２３　デジタルアナログ変換器
２４　変調器
２５　変調器
２６　デジタルアナログ変換器
２７　符号化部
２８　送信電力計算部
２９　制御部

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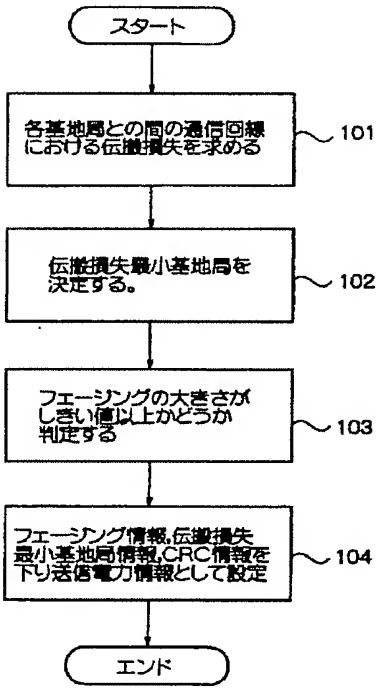
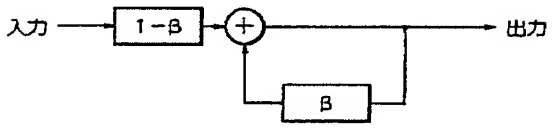
＊３０　基地局制御装置
３１　ＡＴＭスイッチ
３２　制御部
４０　交換局
４１　受信レベル測定部
４２　減算器
４３　アナログデジタル変換器
４４　通信チャネルレイク受信機
４５　復調器
４６　復号化部
４７　下り送信オン／オフ指示信号
５１　ユーザ情報
５２　制御情報
６０　セル
６０ａ、６０ｂ、６０ｃ　セクタ
６１、６２　セル
１０１～１０６　ステップ
＊　２０１～２０８　ステップ

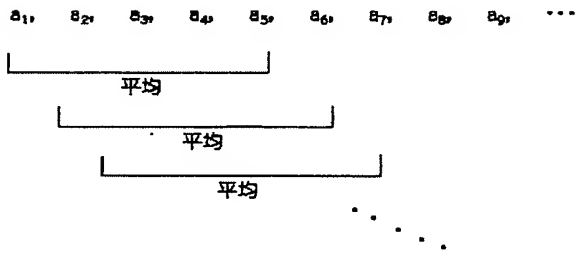
【図１】



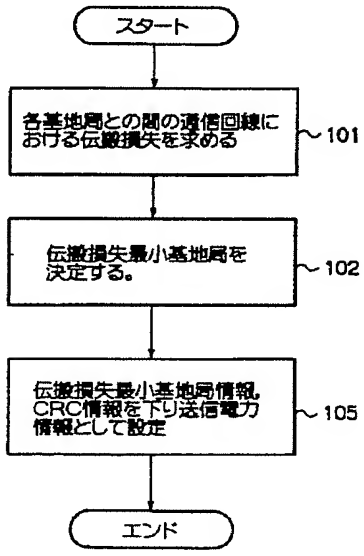
【図４】



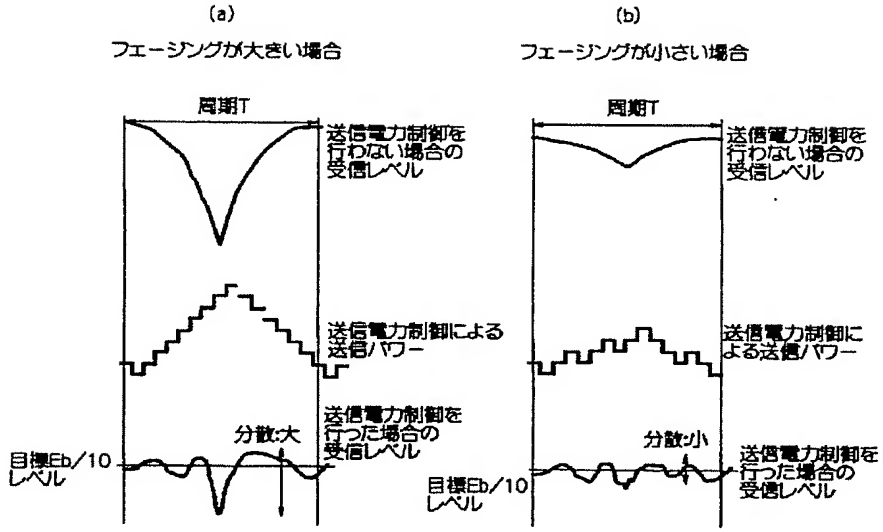
【図３】



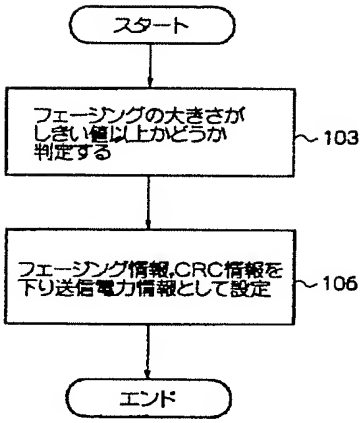
【図７】



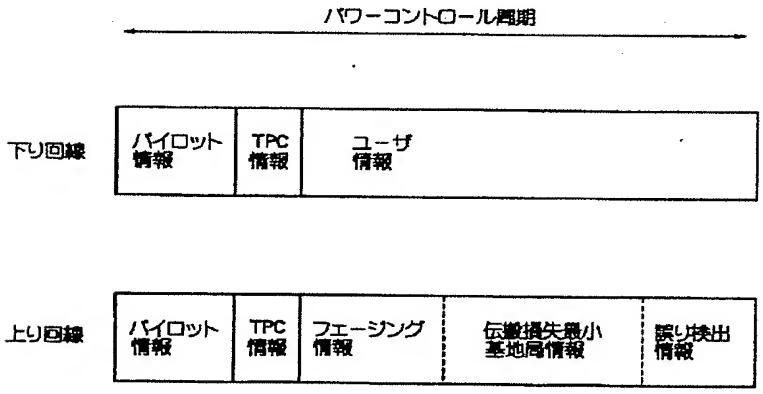
【図２】


(a)
フェージングが大きい場合
周期T
送信電力制御を行わない場合の受信レベル
送信電力制御による送信パワー
送信電力制御を行った場合の受信レベル
分散:大
目標Eb/10レベル
(b)
フェージングが小さい場合
周期T
送信電力制御を行わない場合の受信レベル
送信電力制御による送信パワー
分散:小
送信電力制御を行った場合の受信レベル
目標Eb/10レベル

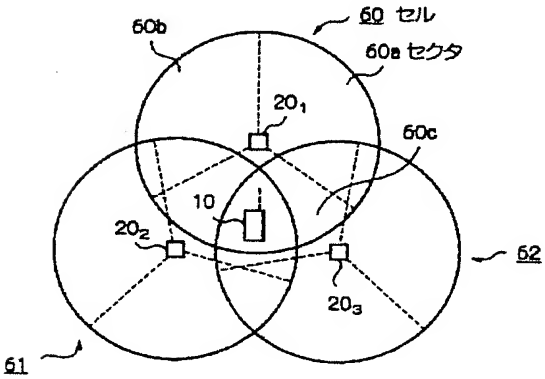
【図９】


スタート
フェージングの大きさがしきい値以上かどうか判定する
103
フェージング情報,CRC情報を下り送信電力情報として設定
106
エンド

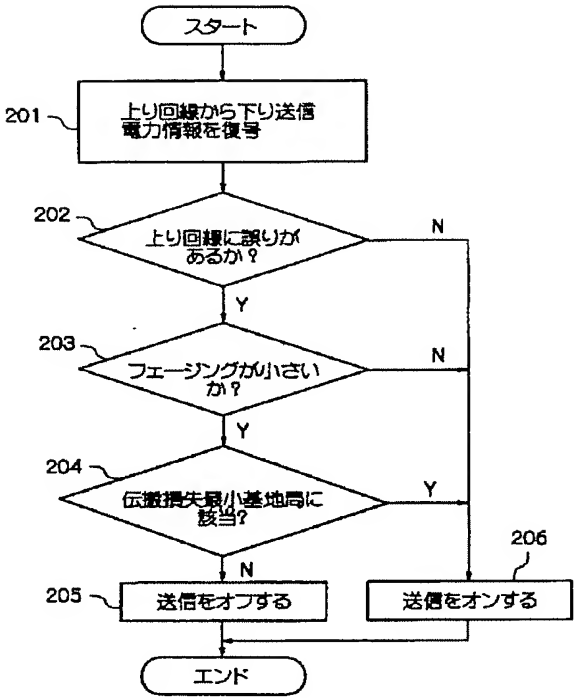
【図５】


パワーコントロール周期
下り回線
パイロット情報
TPC情報
ユーザ情報
上り回線
パイロット情報
TPC情報
フェージング情報
伝搬損失最小基地局情報
誤り検出情報

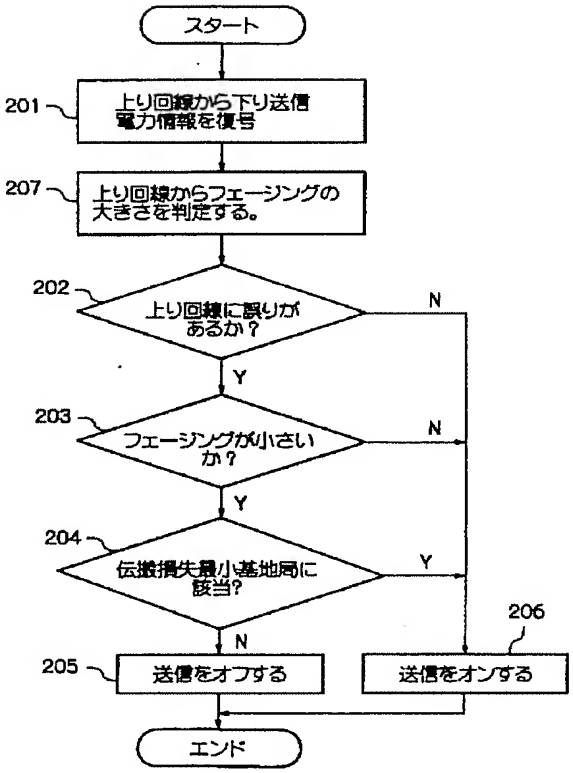
【図１２】


60 セル
60b
60a セクタ
60c
20_1
10
20_2
20_3
52
61

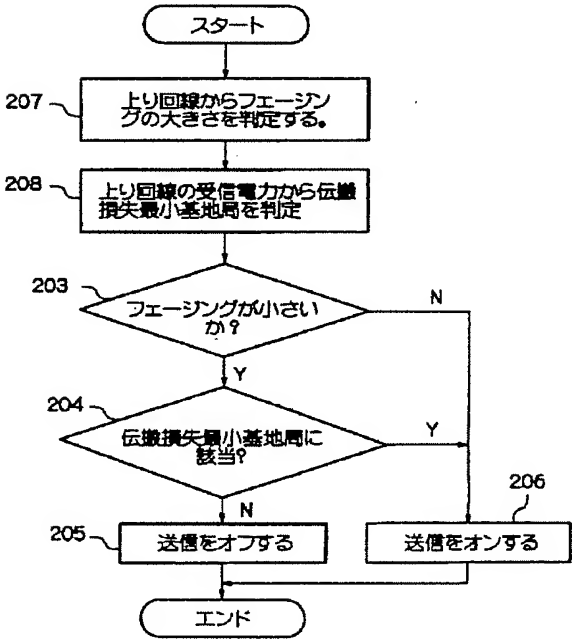
【図６】


スタート
201
上り回線から下り送信電力情報を復号
202
上り回線に誤りがあるか？
N
Y
203
フェージングが小さいか？
N
Y
204
伝搬損失最小基地局に該当？
Y
N
205
送信をオフする
206
送信をオンする
エンド

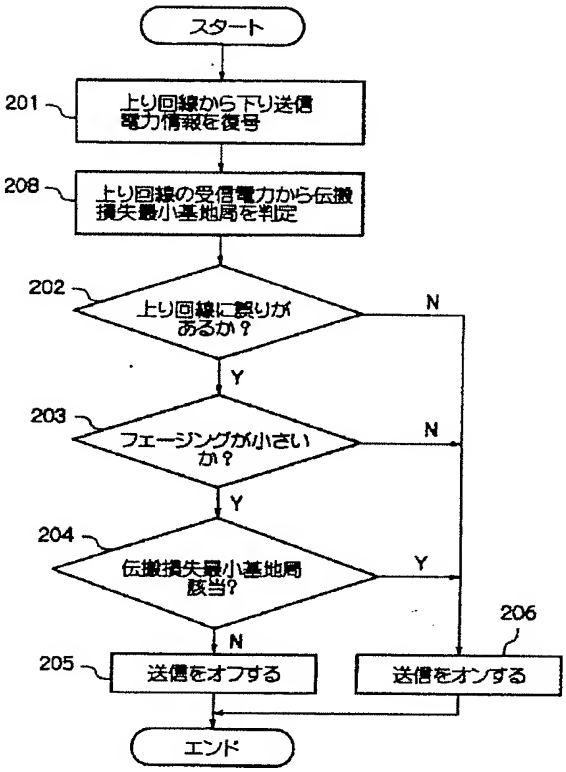
【図８】


スタート
201
上り回線から下り送信電力情報を復号
207
上り回線からフェージングの大きさを判定する。
202
上り回線に誤りがあるか？
N
Y
203
フェージングが小さいか？
N
Y
204
伝搬損失最小基地局に該当？
Y
N
205
送信をオフする
206
送信をオンする
エンド

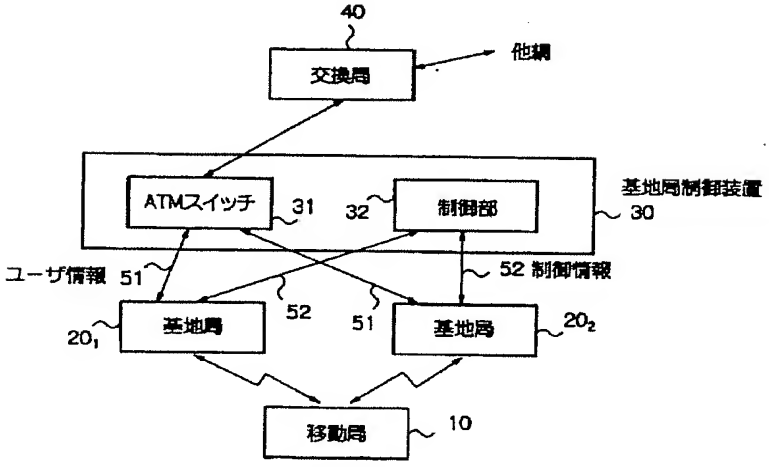
【図１１】


スタート
207
上り回線からフェージングの大きさを判定する。
208
上り回線の受信電力から伝搬損失最小基地局を判定
203
フェージングが小さいか？
N
Y
204
伝搬損失最小基地局に該当？
Y
N
205
送信をオフする
206
送信をオンする
エンド

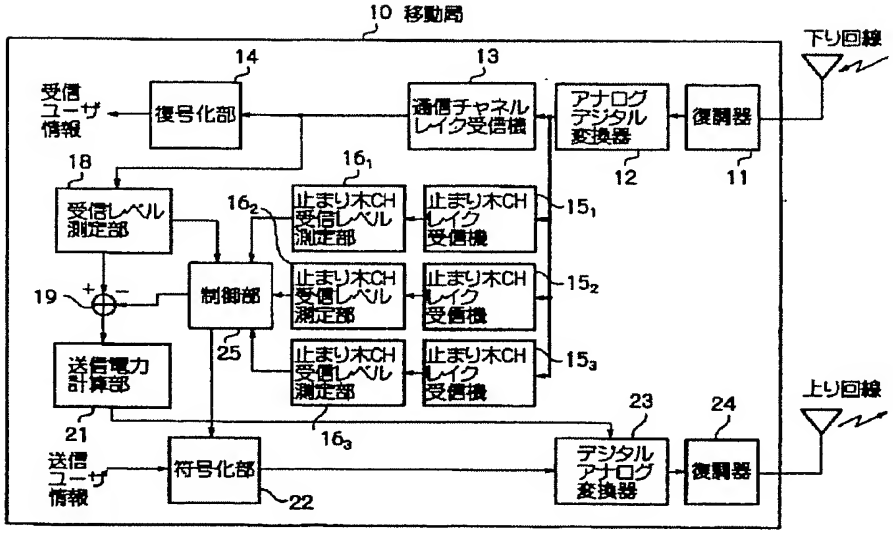
【図１０】


スタート
201
上り回線から下り送信電力情報を復号
208
上り回線の受信電力から伝搬損失最小基地局を判定
202
上り回線に誤りがあるか？
N
Y
203
フェージングが小さいか？
N
Y
204
伝搬損失最小基地局該当？
Y
N
206
205
送信をオフする
送信をオンする
エンド

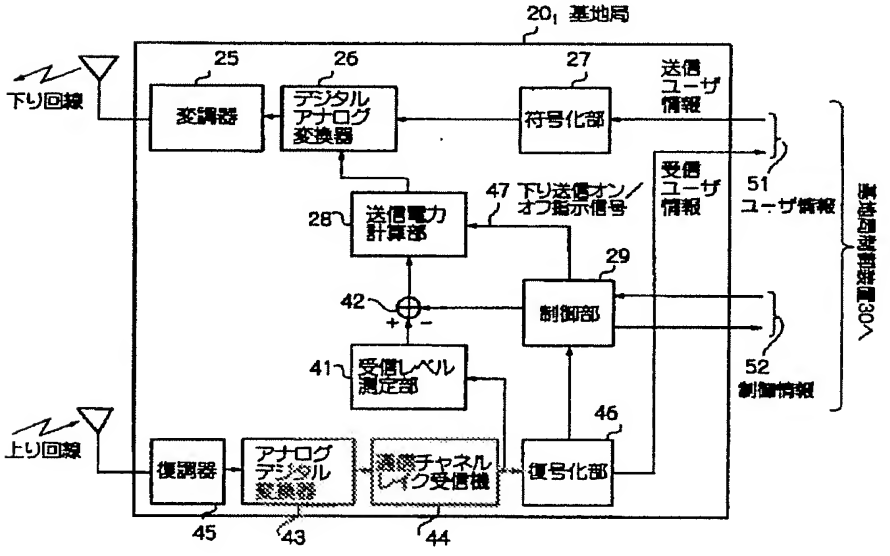
【図１３】


40
交換局
他網
ATMスイッチ
31
32
制御部
基地局制御装置
30
ユーザ情報 51
52 制御情報
52
51
20₁
基地局
基地局
20₂
移動局
10

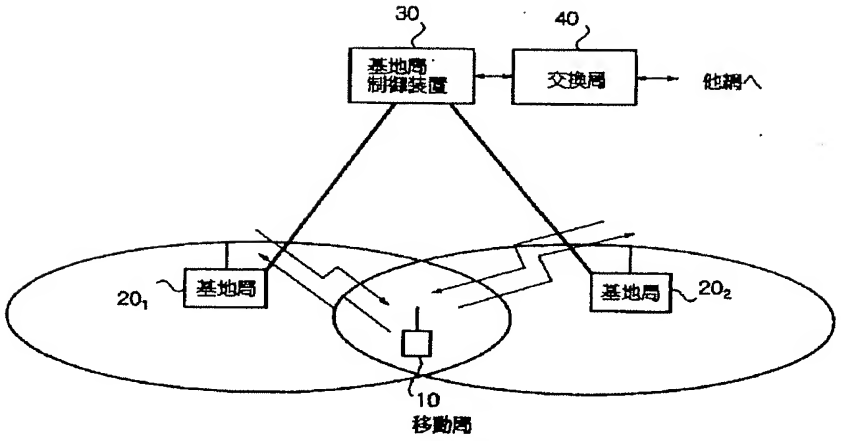
【図１４】


10 移動局
下り回線
14
13
受信ユーザ情報
復号化部
通信チャネルレイク受信機
アナログデジタル変換器
復調器
12
11
18
16₁
受信レベル測定部
16₂
止まり木CH受信レベル測定部
止まり木CHレイク受信機
15₁
19
制御部
15₂
送信電力計算部
25
15₃
21
16₃
23
24
上り回線
送信ユーザ情報
符号化部
22
デジタルアナログ変換器
復調器

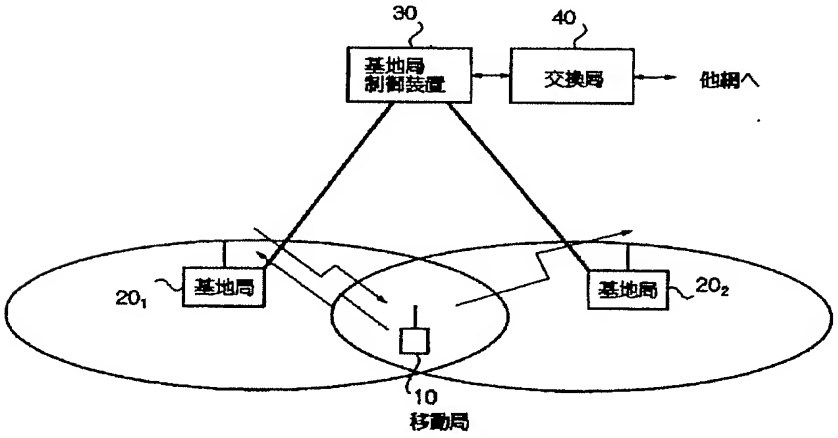
【図１５】


20₁ 基地局
下り回線
25
26
27
変調器
デジタルアナログ変換器
符号化部
送信ユーザ情報
受信ユーザ情報
51
ユーザ情報
47 下り送信オン／オフ指示信号
28
送信電力計算部
29
42
制御部
41
受信レベル測定部
52
制御情報
制御局装置30へ
上り回線
46
復調器
アナログデジタル変換器
通信チャネルレイク受信機
復号化部
45
43
44

【図１６】


30
40
基地局
制御装置
交換局
他網へ
20₁
基地局
基地局
20₂
10
移動局

【図１７】


30
40
基地局
制御装置
交換局
他網へ
20₁
基地局
基地局
20₂
10
移動局